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DRAFT
FIELD IMPLEMENTATION PLAN FOR THE EAST TRENCH PLUME TREATMENT SYSTEM

Prepared for:

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ACRONYMS

ALF	Action Level and Standards Format
ASTM	American Society of Testing and Materials
bgs	below ground surface
CQA	construction quality assurance
CQC	construction quality control
CTR	Contractor Technical Representative
DOE	Department of Energy
DOT	Department of Transportation
EM-40	DOE Environmental Restoration Program
EM-50	DOE Office of Science and Technology
EPA	U. S. Environmental Protection Agency
ES&H	Environmental Safety and Health
ETP	East Trenches Plume
ETPTS	East Trenches Plume Treatment System
FIP	Field Implementation Plan
gpm	gallons per minute
HASP	Health and Safety Plan
HSO	Health and Safety Officer
MSGP	Mound Site Groundwater Plume
MSPTS	Mound Site Plume Treatment System
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
OHM	OHM Energy Services
PAM	Proposed Action Memorandum
PPE	personal protective equipment
PSS	Plant Shift Supervisor
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RMRS	Rocky Mountain Remediation Services, L.L.C.
VOCs	volatile organic compounds

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1. INTRODUCTION

This Field Implementation Plan (FIP) will describe in detail the tasks and procedures required for the installation of the subsurface groundwater collection and treatment system for the East Trenches Plume (ETP). The East Trenches Plume Treatment System (ETPTS) is intended to collect and treat the contaminated groundwater, which is above the Action Level Framework Tier II level concentrations defined in Attachment 5 of the Rocky Flats Cleanup Agreement (RFCA). The ETP remediation is authorized as an accelerated action under the East Trenches Plume Proposed Action Memorandum (PAM).

The ETPTS will employ an innovative technology for the remediation of a contaminated groundwater plume at the Rocky Flats Environmental Technology Site (RFETS). The ETPTS will utilize the reactive iron technology recently implemented at the Mound Site Plume. The Mound Site Plume was a remediation demonstration which was executed as a cooperative effort between the Department of Energy (DOE) Environmental Restoration Program (EM-40), and the DOE Office of Science and Technology (EM-50), with support from the National Risk Management Research Laboratory of the U.S. Environmental Protection Agency (EPA).

The Mound Plume was chosen for the demonstration because the groundwater contained chlorinated organic contamination, hazardous metal contamination, and radioactive contamination in excess of Action Level Framework Tier II level concentrations defined in the RFCA. The seep was representative of other groundwater problems at RFETS and was intended as a demonstration for passive removal and destruction of both radionuclides and chlorinated organics. The Mound Site Plume Treatment System (MSPTS) involved an in-ground barrier system with in situ water treatment. The MSPTS consisted of treatment cells, an impermeable barrier membrane, an engineered porous and permeable media, groundwater collection piping, and barrier monitoring system. The lessons learned during the installation of the MSPTS have been incorporated into the construction strategy for the ETPTS.

In accordance with the PAM, the overall objectives of the ETPTS are:

- Intercept and treat VOC-contaminated groundwater at the distal end of the ETP consistent with Action Level and Standards Framework (ALF).
- To the extent practicable, protect surface water and reduce the VOC-contaminant mass loading in surface water consistent with the ALF.
- Installation of an easily accessible system to reduce operation and maintenance costs, and for ease in media replacement or final removal. The system will be designed to be similar to the MSPTS.
- Minimize the impacts to the Prebles Meadow Jumping Mouse during construction by installing silt fences between the construction area and South Walnut Creek to prevent downstream sedimentation of habitat.
- Avoid depletion of waters to South Walnut Creek.

1.1 Site History

The ETP is located north of Central Avenue, east of the RFETS Protected Area, and along the northern edge of the East Ponds access road. The ETP consists of groundwater contaminated with volatile organic compounds (VOCs). The contamination resulting from the ETP is projected to come from the East Trenches Area. The East Trenches Area is on the north side of the East Access Road, and was used between 1964 and 1967 for disposal of sanitary sewage sludge contaminated with low levels of uranium and plutonium. It is also reputed that crushed drums and miscellaneous wastes were also disposed of in the East Trenches Area. The trenches were excavated and treated as part of an accelerated source removal action. The treated soil below the Tier II action levels was returned to the excavation, and the site was restored. Some of the soil between the Tier I and II levels and were wrapped in geotextile and returned to the excavation.

1.2 Site Geology and Hydrology

The ETP Site is located along the southern edge of South Walnut Creek Drainage. The surficial deposits consist of up to 18 feet of Rocky Flats Alluvium, colluvium and slump deposits. Bedrock, sloping north, underlies the surficial deposits and consists of weathered claystone and minor sandstones associated with the Arapahoe No. 1 Sandstone. This sandstone is truncated by the South Walnut Creek drainage and subcrops beneath the colluvium.

Depth to groundwater is approximately 4 to 14 ft at the ETP Site and flows north to northeast with discharge as seeps, springs, and evaporation in the area near South Walnut Creek. The flow rate for the plume is projected at 2.5 feet per day; 2 feet per day of the flow is attributed to the subcropping Arapahoe No. 1 Sandstone.

1.3 Technology Description and Purpose

The purpose of this project is design, furnish, install, and startup a subsurface groundwater collection system coupled with a passive reactive metals treatment system. The ETPTS will be oriented generally in an east-west direction between piezometers 22597 and 23597. The ETPTS will be approximately 1,100 feet in length at a depth of approximately 16 to 26 bgs. The collection system will be installed at least 6 inches and an average of 3 feet into the claystone. The treated water will be discharged to groundwater using an infiltration galley adjacent to South Walnut Creek.

The technology addressed in this FIP uses innovative barrier technology as a groundwater control technology to capture, redirect, and treat contaminated groundwater, and disburse the treated groundwater. The ETPTS will consist of:

- A single-membrane, impermeable 1,100 feet containment barrier, which will be keyed into the underlying bedrock, located approximately 10 to 26 feet bgs. The upgradient side of the membrane will be backfilled with a graded filter material.
- A four-inch perforated HDPE pipe will be placed in the backfill material and piped to collection sumps. The three sumps will be piped to two treatment cells located downgradient of the barrier and collection system.
- The use of zero valent iron in the treatment cells to remediate the site contaminated groundwater to Action Level Framework Tier II level concentrations defined in the RFCA.
- Installation of three in-trench multiple depth monitoring points on the upgradient side of the barrier.
- Installation of four groundwater monitoring wells within the recovery system to aid in the evaluation and monitoring of the performance of the groundwater recovery system
- Abandonment of 11 geoprobe wells in or around the barrier wall.

2.0 FIELD EXECUTION

The ETP consists of the installation of a groundwater collection and treatment system for the East Trenches Area. Parsons Infrastructure & Technology Group, Inc. (Parsons) has prepared a detailed design package including Construction Drawings and Construction Specifications. The following sections detail the procedures for installing the ETPTS.

The proposed location for the installation of the ETPTS is north of the ETP and south of South Walnut Creek. The ETP is believed to extend northward from the East Trenches Area and discharges as seeps and subsurface flows into South Walnut Creek Drainage. Recent investigations indicate that the ETP consists of contaminated groundwater in the alluvium, colluvium and the underlying Number One Sandstone. Groundwater appears to flow primarily along the bedrock surface. Therefore, the ETPTS will be installed as intended to minimize the ETP before it discharges to the seeps and treat the contaminated water before it can reach the surface water contained in South Walnut Creek.

The sequence of construction activities is expected to involve the following: mobilization of equipment and personnel; ETP Site preparation; discharge and reactor area construction; collection trench construction, well construction and abandonment; collection sump construction; work area restoration; and demobilization of equipment and personnel. The work is scheduled to be initiated on January 4, 1999 and completed April 9, 1999.

2.1 Mobilization

The project field crew, health and safety materials, vehicles, and small equipment will be jointly mobilized primarily from the OHM Energy Services (OHM) office in Denver, Colorado. All heavy equipment, support equipment, and subcontractor services will be obtained from the OHM Denver Yard or vendors in the local area. Mobilization of the key personnel Project Manager, Health and Safety Officer (HSO), Superintendent, Equipment Operators and Field Technicians who are experienced with the installation of barrier systems and associated construction techniques will be mobilized as needed to meet project objectives.

The project construction work will require the following equipment to be mobilized from the OHM Denver Yard or rented from local vendors. Some of the equipment required on-site includes:

- One rubber-tired front-end loader with interchangeable fork lift attachment
- One bulldozer
- One backhoe
- Articulating Manlift
- Two boom trucks/cranes
- Office equipment
- Computers
- Two pickup trucks
- Air monitoring equipment
- Miscellaneous equipment.

Materials and personal protective equipment (PPE) will be brought to the site by OHM or procured from local vendors and delivered to the site. The following documentation and permitting will be approved and available before starting the ETP:

Provided by OHM

1. A Field Implementation Plan identifying project goals and requirements is required for the ETPTS.
2. Health and Safety Plan. A construction health and safety plan (HASP) that has been reviewed and approved by DOE and Rocky Mountain Remediation Services, L.L.C. (RMRS)

will be available for review by site workers and visitor personnel prior to the commencement of work and at all times during construction. The HASP will be available at the work site location. Amendments to the HASP will be incorporated as required. The HASP will be required reading for all project personnel.

3. Preconstruction environmental safety and health (ES&H) training prior to commencement of work shall be provided for all project contractor site worker and management personnel. Each day during construction will begin with a plan-of-the-day and safety meeting, and a record of such training will be maintained in the project logbook.
4. Project support subcontracts shall be in place prior to the start of construction and shall include the following:
   - Construction equipment shall be contracted for and mobilized prior to commencement of construction, or on an as needed basis.
   - A contract shall be in place for backfill material and the material shall be available for use at the commencement of construction.
   - Contract ES&H support will be available during all phases of installation and construction for this project.

Provided by Others

1. It is anticipated that installation of the ETPTS at this site can be done under existing agreements between the site owners and the State of Colorado regulatory agencies, and that no additional permits will be required. Site specific permits will be required such as a ground disturbance permit. Site specific permits will be obtained and coordinated with the CTR.
2. The National Environmental Policy Act (NEPA) requires federal agencies to use a systematic process to provide environmental impact information to federal, state, local, and Indian Nation officials, as well as citizens before decisions are made to take major actions that may significantly affect the environment. Federal agencies are required to study, develop, and describe impacts and alternatives and obtain public input to recommended courses of action. For DOE and other federal agencies, the NEPA process is an integral part of program planning. This process was completed in the Proposed Action Memorandum, RMRS 1998.
3. Utilities required during installation of the ETPTS will be available beginning with the mobilization phase. Utility service will be required throughout the construction phase of the project, with limited service available during the monitoring and sampling phase after the barrier and treatment cells have been installed. Utilities include electrical, as well as water, sanitary services and office space w/phone and fax available. These utility services will be available as required.
4. A preconstruction meeting shall be conducted that details all aspects of installation of the ETPTS, the treatment cells, quality assurance, job responsibilities, reporting, etc.

2.2 Work Area Preparation

The ETPTS will be oriented generally in an east-west configuration. Work area preparation will consist of construction of a 20 to 30 foot wide level work platform.

Site security will consist of appropriate posting of the site and visible barrier control. It is not anticipated that flagmen or other forms of traffic control will be necessary. Trucks and equipment will be entering from Center Street and approach the site from the south east down the dirt road located immediately east of the ETP.

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2.2.1 Site Preparation

Prior to initiating construction operations, the following site preparation activities will be performed by OHM and others.

- A Preconstruction Meeting will be held with all project personnel present. This will consist of an explanation of OHM/RFETS procedures, points of contact throughout site activities, and a briefing of the HASP.
- Coordinating with RMRS personnel (i.e., fire department, building and zoning, plumbing, electrical, and environmental) to obtain necessary work permits and notices of site construction.
- Establishing temporary facilities such as office trailers, storage trailers, sanitary facilities, parking areas, personnel and equipment decontamination areas, areas for storage of construction materials, and areas for staging (containing) construction wastes.
- Coordinating and identifying water supply for construction activities and/or personnel and small equipment decontamination.
- Coordinating and identifying underground and overhead utilities that may impact construction activities.
- Identifying access and haul routes for material deliveries and construction activities.
- Establish work zones in accordance with the HASP.

2.2.1.1 Sediment and Erosion Control Measures

Several actions to lessen the environmental impact due to erosion will be taken during the construction phase of the ETPTS Project.

- In accordance with the DOT guidance, silt fences will be installed downgradient of all intrusive work, as needed.
- Trenches or pits shall be backfilled and stabilized as soon as possible to reduce the risk of erosion.
- Measures shall be taken, as necessary, to provide sediment and erosion control around temporary soil areas.
- Periodic inspections will be made to verify silt fencing is in operational condition.
- Hay/straw bales, if required, will be replaced as needed and will be staked.

2.2.2 Site Survey

A site survey will be conducted prior to commencement of any construction work at the site. Included in the survey will be: staking barrier wall alignment at 25-foot intervals along the entire alignment, and surveying of offsets on a 25-foot grid across the area of the site which may be impacted by construction activities. Survey tolerances will be maintained to within +/-2 tenths with the exception of well and piezometer surveying, which will be maintained within +/- 1 tenth. Survey reference points will also be identified and placed outside of the construction area to be used as reference during construction, and verifying design elevations.

2.2.3 Segregation of Topsoil

Prior to trenching or excavating for the ETPTS a minimum of 12 inches of material at the surface will be removed from the areas where construction will be taking place. The topsoil will be segregated separately and stockpiled to be used as final cover after construction of the ETPTS. The vegetation including any debris will be removed prior to stockpiling the topsoil.

2.3 Reactor and Discharge Area Construction

The installation of the reactor and discharge system will involve the installation of two treatment cells followed by a metering manhole with final discharge to a french drain. The following sections provide detail on the installation of this system.

2.3.1 Installation of the Treatment System

The groundwater collected by the three barrier wall collection sumps will be piped to two treatment cells, followed by a metering manhole with final discharge to a french drain. The treatment system will be installed per the Construction Specifications and Drawings prepared by Parsons. Groundwater movement through the system will be by gravity flow. The treatment system will be located northeast of the northern-most part of the barrier wall, south of Pond B-4.

The treatment system will be installed below grade, and the excavation will be constructed with the sides of the excavation cut to a 1.5 (horizontal) to 1 (vertical) slope. Entrance into the excavation will be limited, but will be required to make plumbing connections between the process equipment. Personnel entering the excavation will do so in accordance with OSHA 1910.146, Rocky Flats permit required confined space procedures, and the Health and Safety Plan for confined space entry. Care will be taken to excavate only what is necessary to safely install the ETPTS. The bottom of the excavation will be leveled and a reinforced concrete foundation poured; the tanks will be placed on top of the foundations. It is anticipated that some portion of the treatment cells will be located below the water table. Therefore, the cells will be ballasted to prevent flotation if the contents are removed.

The treatment cells will be plumbed and valved to allow the operator to change the flow configuration to accommodate the flow in the cells in parallel or series or to be by-passed entirely. All piping will be pressure and leak tested to confirm system integrity. The valving will be compatible for underground burial and direct loading of the overburden soils.

Following installation of the treatment cells and completion of piping connections into and out of the cells, the cells will be filled with media as detailed in the Construction Specifications and Drawings. The reactors are approximately 12 feet in diameter and each will be loaded with approximately 58 to 59 tons of reactive iron treatment media. The bottom of the reactor will be filled with one foot of permeable filter gravel, covered with geotextile fabric, followed by seven feet of iron and then topped with one foot of a 50/50 iron/pea gravel mixture. Finally, a 4-foot railing will be provided around the opening in the tops of each of the treatment reactors.

The iron will be delivered in 1.5 ton super sacks with lifting straps and a dispensing chute on the bottom of the sack. The iron will be placed into the reactors using a crane to lift the super sacks. The sacks will be emptied through the chute in the bottom of the sacks. Care will be taken to minimize the dust associated with this activity. The person directing the material into the reactor may be required to wear a respirator. Dust monitoring will be performed to determine appropriate PPE. The iron/pea gravel mixture for the top 1-foot of material in the reactor will be mixed on site and loaded into the reactors with the bucket of the front-end loader. Again, air monitoring will be performed to determine the appropriate PPE.

2.3.1.1 Treatment System Materials

The following sections indicate the specifications of the materials required for the construction of the treatment system.

Geotextile Filter. The geotextile filter fabric will be a nonwoven or woven pervious sheet of polymeric material with long-chain polymers of at least 85% by weight polyolefins, polyesters, or polyamides. The geotextile filter and installation will meet or exceed the requirements of Specification 02272. The physical properties of the fabric will consist of the following:

- Apparent opening size between 70-100 (U.S. Sieve)
- Permittivity of 1.0 Sec^{-1}
- A minimum trapezoid tear, grab tensile, seam strength, and puncture strength of 75, 180, 40, and 110 pounds respectively

- A burst strength of 350 psi
- Ultraviolet degradation of 70% retained at 500 hours

HDPE Treatment Cells. The treatment cells will be constructed of Type III, Category 3, Class B polyethylene in accordance with ASTM D 1248. The material shell and bottom will be one molded piece with a nominal wall thickness of 1-inch. Each cell will be 12 feet in diameter, 12 feet high, and have a 6 feet by 6 feet square double leaf, galvanized or aluminum, hinged top access door for admittance of personnel and installation of treatment media. The HDPE treatment cells and installation will meet or exceed the requirements of Specification 02730.

HDPE Piping. The piping from the collection sump to the treatment cells and finally to the french drain will be constructed of 2-inch HDPE, with a standard dimension ratio (SDR) of 32.5 or less, meeting ASTM D 3350. All fittings associated with the HDPE will be butt fused in the field, threaded or flanged. An HDPE or PVC flange will be used to transition from HDPE piping to the cells. The HDPE piping and its installation will meet or exceed the requirements of Specification 02660.

Valves. The ball valves will consist of 2 inch valves with stem extension designed with a working pressure no less than 150 psi. The body of the valve will meet the requirements of ASTM D 3550, and the stem will meet the requirements of RFP Standard SP-220. The valves will be designed for below ground installation such that the valves can be operated from the ground surface. The valves and their installation will meet or exceed the requirements of Specification 02660.

Valve Boxes. The valve boxes will consist of cast iron extension type boxes with slide type adjustment and a flared base. The cast iron will be at least 3/16 inch thick and the word "water" will be cast into the cover. The valve boxes and their installation will meet or exceed the requirements of Specification 02660.

Iron Treatment Media. The iron will have a grain size distribution of approximately –8 to +50 mesh US Standard Sieve size, and a field bulk density ranging from 140 to 180 pounds per cubic foot. The iron treatment media and installation will meet or exceed the requirements of Specification 02730.

Granular Material. The granular material will consist of well-graded sand, gravel or crushed gravel, crushed stone or crushed slag composed of hard, tough and durable particles, with no more than 10% by weight passing the No. 200 sieve and no less than 95% passing the 1-inch sieve. The granular material and its installation will meet or exceed the requirements specified in Specification 02222.

Metering Manhole and Flow Measuring Equipment. The metering manhole will be glass-fiber-reinforced polyester and conform to ATSM D 3753. The metering manhole will be up to 4 feet in diameter and height will be determined after the initial survey. Antiflotation anchors will be sized and located as required by the manufacturer and the design calculations. The metering manhole and installation will meet or exceed the requirements of Specification 02730.

The flow measurement equipment will consist of an HS-Flume, a non-contact ultrasonic flow sensor, and an electronic data storage unit. The measurement system will be able to measure flows of 0.1 to 2.5 gallons per minute. A local readout will provide total flow volume in gallons and instantaneous flow rate in gallons per minute. Flowlink software (version 3 or later) will provide the means for programming and retrieving stored data from the electronic data storage unit. A lead acid battery and a solar battery charger will power the metering system. The flow measuring equipment and installation will meet or exceed the requirements of Specification 13321.

Railings. The railings will consist of ASTM A 53, Schedule 40 pipe sections of 1.25-inch diameter. Railings will be shop welded and if field welding is required, ground smooth at all connections. All welding material will match filler metal type and meet the requirements of ASTM D1.1. The railings and installation will meet or exceed the requirements of Specification 05720.

Bollards. The bollards will consist of ASTM A 500, Grade B, Schedule 40 steel pipe sections that have been galvanized in accordance with ASTM A 123. The bollards will be filled with 3,000 psi concrete which meets the requirements of Specification 03300. The bollards and their installation will meet or exceed the requirements of Specification 05720.

French Drain. The french drain will consist of a 24-inch perforated pipe manufactured of Type III, Category 3, Class B polyethylene in accordance with ASTM D 1248. The perforated pipe will be bedded in ¾-inch to 1½-inch crushed stone. The drain will have two influent penetrations, one from the metering manhole and one from the treatment cells. The drain will have one effluent penetration for overflow to the South Walnut Creek. The overflow drain will be routed to a dispersion gallery constructed to withstand 5 gpm. The french drain and its installation will meet of exceed the requirements of Specification 02222.

2.3.1.2 Quality Control for Treatment System Construction

The following technical submittals shall be completed prior to commencement of work and/or installation of the associated material and submitted to RMRS for review and approval. The submittals required are outlined below:

french drain, Section 02222

- Manufacturer's installation instructions for french drain
- Laboratory results for backfill materials

geotextile, Section 02272

- Manufacturer's and/or fabricator's quality control manuals.
- Manufacturer's and/or fabricator's certified quality control test results.
- Sample

piping, Section 02660

- Manufacturer's recommended installation instructions
- Results of pipe testing

metering manhole, collection sumps, and treatment cells, Section 02730

- Manufacturer certified raw material data sheets with quality control certificates.
- Manufacturer installation instructions for the metering manhole, including information on antiflotation anchors; collection sumps; and the treatment cells.
- Manufacturer's and fabricator's certified quality control test results.

concrete, Section 03300

- Concrete mix design, concrete supplier, and batch tickets and history
- Manufacturer's certificates for concrete and grout

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railing and bollards, Section 05720

- Welder's certification

flow measuring equipment, Section 13321

- Manufacturer's catalog data, shop drawings, installation instructions for flow level measuring equipment components, HJS Flume, and ultrasonic transmitter
- Manufacturer's catalog data, shop drawings, installation instructions for read-out device
- Manufacturer's operating and maintenance instructions for each piece of equipment furnished.

Quality control during installation will involve the verification of grade, maintenance of inventory of geosynthetic rolls, verification of handling and storage of geosynthetics, installation in accordance with the manufacturer's installation instruction, conformance to the Design Specifications, and overall system integrity. This verification will be conducted utilizing the three phase of inspection. Checklists will be generated prior to initiating this phase of work and will be used to verify compliance throughout completion of the treatment system installation. The quality control program for installation of the treatment system will also include the following:

- Treatment system piping will be both pressure tested and leak tested. The pressure test will be a 1-hour hydrostatic test at a pressure of 20 psi. The leak test will be a 2-hour test at 50 psi.
  - *Testing Procedure* - This procedure was adapted from PPI Technical Report TR31 by the Plastics Pipe Institute.
    - Fill the pipeline with water after it has been laid; bleed off any trapped air. Subject the lowest element in the system to a test pressure of 20 psi, and check for any leakage. When, in the opinion of the engineer, local conditions require that the trenches be backfilled immediately after the pipe has been laid, apply the pressure test after backfilling has been completed.
    - The test procedures consist of two steps: the initial expansion and the test phase. When test pressure is applied to a water-filled pipe, the pipe expands. During the initial expansion of the pipe under test, sufficient make-up water must be added to the system at hourly intervals for three hours to maintain the test pressure. After about four hours, initial expansion should be complete and the actual test can start.
    - When the test is begins, the pipe is full of water and is subjected to a constant test pressure of 20 psi. The test phase should be conducted for one hour after which time any water deficiency must be replaced and measured. Add and measure the amount of make-up water required to return to the test pressure. The allowance for expansion under 20 psi test pressure for 2-inch HDPE piping after one hour is 0.08 gal per 100 feet of piping.
    - The leak test consists of maintaining a 50-psi test pressure over a period of two hours, and then dropping the pressure by 10 psi (0.069 Mpa). If the pressure then remains within 5% of the target value for one hour, this indicates there is no leakage in the system.
- Prior to setting the treatment cells, the elevations will be verified to assure that the as-built elevations are at the design elevations.
- All HDPE welds used to weld the HDPE pipe will be visually inspected for weld integrity.
- All piping will initially be backfilled with 1.5 feet of granular material. Native material will be used to backfill the trench to grade. The trench will be backfilled in 12-inch lifts and will be wheel rolled for compaction.

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2.4 Collection Trench Area Construction

The collection trench construction will involve the excavation of the trench and installation of the barrier wall, trench backfill, and installation of the collection sumps. The following sections provide additional detail regarding the construction of the collection trench.

2.4.1 Trenching and Installation of the Barrier Wall

The trench will be excavated to the desired depth along the length of the barrier wall. The 80-millimeter HDPE sheeting will be suspended along the downgradient side of the trench. The HDPE sheets will be installed as excavation of the trench is completed to minimize the time the excavation is open. Excavation of the trench and construction of the barrier wall collection system will be started at one end of the trench and progress to the terminal end of the barrier system. The HDPE sheets are 15 feet wide and 15 to 20 feet long depending on the length required allowing for 3 feet above grade. The sheets will be joined with an interlocking sealable joint system. The HDPE barrier wall will be constructed continuously from the eastern most end of the alignment to the western most end of the alignment.

The HDPE sheets will be lifted and placed using light duty cranes (18 to 25 tons) or boom trucks. The sheets will be fixed to a support structure to give the sheets rigidity. Placed sheets will be held with the crane or boom truck while a second crane or boom truck is used to lift and thread the next sheet in the barrier system. The sheets will be supported by piping to the top of the north sidewall of the excavation during the backfill procedures.

Once the sheets are in place, the bottom of the trench will be backfilled with bentonite to seal the bottom of the HDPE sheets and limit the potential for underflow of groundwater around the barrier system. The bentonite will be placed in one 24-inch lift through the chute in the super sacks.

Once the bentonite is in place, geotextile will be placed across the bentonite and up the upgradient slope to separate the bentonite from the granular backfill. The trench will be backfilled with 4 inches of granular backfill, and then the perforated HDPE collection piping will be installed on top of the backfill.

The collection piping will be constructed of 4-inch HDPE perforated pipe with solid HDPE sections extending to grade at each end of the trench for clean out stations. Based on the specifications provided for the pipe perforations and backfill, a geotextile sock will be required to prevent fines from entering the collection piping.

The granular backfill will be backfilled to approximately 3 feet above the water table, typically 8 feet of material throughout the trench. The 2-inch conveyance pipe will be placed between the perforated pipe and the top of the granular backfill. The geotextile fabric will then be folded back to separate the granular backfill from the impermeable soil and native soil. A minimum of 3 feet of impermeable soil will be placed on top of the granular backfill. If more than 3 feet of soil is needed to bring the trench back to level ground, random backfill may be used, once the 3 feet of impermeable soil is placed.

Low-permeable soil will be placed in successive horizontal 10- to 12-inch loose lifts and compacted with a minimum of 5 passes of the compaction equipment. The random backfill will be placed in successive horizontal layers not to exceed 12-inch loose lifts and compacted with a minimum of 2 passes of compaction equipment. The bentonite and granular backfill have no particular lift or compaction limitations.

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2.4.1.1 Barrier Wall Materials

The following sections indicate the specifications of the materials required for the construction of the barrier wall.

Geotextile Filter. The geotextile filter fabric will be a nonwoven or woven pervious sheet of polymeric material with long-chain polymers of at least 85% by weight polyolefins, polyesters, or polyamides. The geotextile and its installation will meet of exceed the requirements of Specification 02272. The physical properties of the fabric will consist of the following:

- Apparent opening size between 70-100 (U.S. Sieve)
- Permittivity of 1.0 Sec^{-1}
- A minimum trapezoid tear, grab tensile, seam strength, and puncture strength of 75, 180, 40, and 110 pounds respectively
- A burst strength of 350 psi
- Ultraviolet degradation of 70% retained at 500 hours

Geomembrane Vertical Barrier. The panels will be constructed of 80-mil HDPE geomembrane. The geomembrane and its installation will meet of exceed the requirements of Specification 02271. The HDPE geomembrane will be manufactured of first quality resin, and have the following properties:

- Tensile strength at break of 280 lbs/in width
- Elongation at break of 600%
- Tear and puncture resistance of 45 and 100 pounds, respectively
- Low Temperature brittleness of –90°F
- Stress Crack Resistance of 200 minimum hours

The panels will be connected with the interlocking sealable joint system. All joints will be visually inspected to ascertain the integrity of the seam.

HDPE Collection Piping. The piping for subdrains will be constructed of 4-inch perforated corrugated HDPE drainpipe. A geofabric sock will be placed over the collection pipe to prevent fines from entering the pipe. Piping for collection pipe will be designed for 5-gpm flow. All fittings associated with the subdrains will be connected with manufacturers specified snap couplings. An HDPE or PVC flange will be used to transition from HDPE piping to the cells. The HDPE piping and its installation will meet or exceed the requirements of Specification 02490.

Granular Material. The granular material will consist of well-graded silica-based sand, gravel, crushed stone or crushed slag composed of hard tough and durable particles with no more than 10 percent by weight passing a No. 200 mesh sieve and no less than 95 percent by weight passing a 1-inch sieve.

Low-Permeability Material. Soils excavated from the trench that meet the soil classifications per ASTM D 2488 of SC, CL, GC, ML, MH, or CH.

Random Backfill. Excavated material not meeting the requirements or in excess of the quantity required as low-permeability material.

Bentonite. The bentonite used for the bottom seal will be transported to the site in 1.5 ton super sacks and consist of commercial grade high solids pure bentonite. The bentonite will be either granules or pellets and will be no bigger than 0.25 inches in diameter.

2.4.1.2 Quality Control for Barrier Wall Installation

The following technical submittals shall be completed prior to commencement of work and/or installation of the associated material and submitted to RMRS for review and approval. The submittals required are outlined below:

backfill materials, Section 02222

- Visual classification of the low-permeability materials in accordance with ASTM D 2488
- Certified test reports and analysis for granular material in accordance with ASTM D 422
- Compaction equipment and procedures to be used during compaction to meet the specifications

subdrainage system for collection trench, Section 02249

- Manufacturer's installation recommendations for each material or procedure

geomembrane and geotextile, Sections 02271 and 02272

- Geomembrane manufacturer's certified raw and sheet material data sheets and quality control certificates.
- Geomembrane and geotextile manufacturer's and/or fabricator's quality control manuals.
- Geomembrane and geotextile manufacturer's and/or fabricator's certified quality control test results.
- Geomembrane certified factory seam strength test results
- Geomembrane and geotextile sample
- Manufacturer specifications and drawings will be submitted for the HDPE panels and interlocking system.

Quality control during installation will involve the verification of grade, maintenance of inventory of geosynthetic rolls, verification of handling and storage of geosynthetics, installation in accordance with the manufacturer's installation instruction, conformance to the Design Specifications, and overall system integrity. This verification will be conducted utilizing the three phase of inspection. Checklists will be generated prior to initiating this phase of work and will be used to verify compliance throughout completion of the barrier wall installation. The quality control program for installation of the barrier wall will also include the following:

- Each HDPE panel will be numbered for positioning in the trench. This will be based on the depth of the trench at particular alignment locations. The HDPE panels will be inspected upon delivery to site and prior to installation. Any foreign material will be removed from the joints and any damage to, or nonconformity of, joints and/or panels will be repaired or rejected.
- The integrity of the interlock between the adjacent panel will be verified by noting the joint/sealant connection during installation. If there is any question that the sealant is not properly installed, the panel will be pulled and the reset.
- HDPE welds used to weld the collection pipe to the collection sump will be visually inspected for weld integrity.
- Maintenance and submission of final as-built drawings of geomembrane installation showing panel/sheet numbers and penetrations.
- Maintenance and submission of inspection checklists, in field-test reports, and daily quality control reports.
- A minimum of one particle size analysis in accordance with ASTM D 422 will be performed on each different type of material used a backfill.

2.4.2 Collection Sump Installation

Collection sumps will provide collection points for groundwater captured by the geomembrane barrier and collection system. The collection piping will be plumbed into 48-inch collection sumps, located on the up-gradient side of the barrier wall. Collected groundwater will be piped from the collection

sumps to the treatment cells located down the slope from the sumps. The sumps will be constructed of fiber reinforced polyethylene and will be manufactured off-site. Drawing 0107 of the design contains a detail showing the collection sump details. The collection sump will be engineered so that it will classify structurally as a confined space to allow personnel entry into the sump for service or maintenance.

If soil conditions are not stable during the excavation for the sump, an area approximately five feet by seven feet will be shored using an approved shoring system. Prior to lowering the collection sump into place, the bottom of the excavation will be prepared with approximately two feet of the same backfill material used in the trench to structurally support the bottom of the sump. Entry into the shored excavation will be limited. When entry is required, it will be done in accordance with all applicable confined space entry rules and regulations. All penetrations through the sumps for the collection and effluent piping will be mechanical connections. Prior to backfilling, the sump will be filled with water. Backfill material will consist of the same backfill material used in the trench.

2.4.2.1 Collection Sump Materials

The following sections indicate the specifications of the materials required for the construction of the manholes.

Granular Material. The granular material will consist of well-graded silica-based sand, gravel, crushed stone or crushed slag composed of hard tough and durable particles with no more than 10 percent by weight passing a No. 200 mesh sieve and no less than 95 percent by weight passing a 1-inch sieve.

Collection Sumps. The sumps will be 48 inches in diameter with a nominal wall thickness of 1-inch. The outside of the sumps will be ribbed with a smooth interior surface. All penetrations into the sumps will be sealable with standard fittings and methods with integral frames and covers. The sumps will have hinged accessway and protected by standard, concrete-filled bollards. The collection sumps will meet or exceed the requirements of Specification 02730.

2.4.2.2 Quality Control for Sump Installation

The following technical submittals will be provided by OHM prior to commencement of work and/or installation of the associated material and submitted to RMRS for review. The submittals required are outlined below:

- Prior to purchasing the collection sumps, manufacturer's raw material data sheets will be generated by the vendor and submitted to OHM for review and submission to RMRS
- Prior to installation of the collection sumps, manufacturer's and/or fabricator's certified quality control test reports and installation instructions will be generated by the vendor and submitted to OHM for review and submission to RMRS
- Prior to backfill operations, geotechnical data on the backfill material will be reviewed and submitted.

Quality control during installation will involve the verification of grade, installation in accordance with the manufacturer's installation instruction, conformance to the Design Specifications, and overall system integrity. This verification will be conducted utilizing the three phase of inspection. Checklists will be generated prior to initiating this phase of work and will be used to verify compliance throughout completion of the sump installation.

2.5 Well Construction and Abandonment

This task will involve the installation of four groundwater monitoring wells, installation of three trench-monitoring piezometers, and the abandonment of up to 11 geoprobe wells

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2.5.1 Groundwater Monitoring Well

Four groundwater monitoring wells will be installed. The wells will be installed by a driller licensed in the State of Colorado and a geologist with at least 3 years of experience in hazardous waste projects, logging, and well installation. A well permit will be prepared for each well and signed by a member of the Rocky Flats Facility environmental staff prior to submittal to the State of Colorado.

Each well will be constructed according to Specification 02671 and pertinent RFETS standard operating procedures. The wells will be constructed with 2-inch ID schedule 40 PVC flush-threaded pipe screen, silica sand, filter pack, bentonite seal, cement-bentonite grout, concrete surface pad, protective cover, and metal identification tag. The wells will be installed using 6.25-inch ID, 10.25-inch OD hollow stem augers. Continuous soil samples will be collected using a split tube sampler or a continuous sampler.

After the borehole has been drilled, the well screen and riser pipe will steam cleaned and carefully placed. The well screen will be placed approximately at the weathered bedrock/colluvium interface. Filter pack will be continuously installed in the boring from 0.5 feet below the screen with a steam cleaned tremie pipe or through the hollow stem auger. Frequent measurements will be made inside the annulus during retraction to ensure the filter pack is properly placed. The depth of the top of the filter pack will be directly measured and recorded.

The bentonite seal will be placed on top of the filter pack to a minimum depth of 1 foot and a maximum depth of 1.5 feet, before hydration. The bentonite will be placed in 6-inch lifts and hydrated with water. When the full thickness of the seal has been placed, a minimum of 2 hours will be allowed for complete hydration of the seal before grouting. Grout will only be required if it is needed to meet the minimum requirements after placement of 1.5 feet of bentonite seal and 3.0 feet of concrete surface seal. If grout is required, no work will be conducted in the well within 48 hours of grouting and the alignment will be verified prior to placing the cement surface seal.

The concrete surface seal will be placed to a minimum depth of 1.5 feet and a maximum depth of 3.0 feet below ground surface. The steel protective casing will be placed over the riser during the concrete surface seal placement. The concrete surface seal will be allowed to settle prior to pouring the surface pad. The surface pad will be 3 feet square and a minimum of 5 inches thick.

Water removed during drilling will be filtered of its fines and placed in 55-gallon drum, properly labeled and placed on pallets. The fines and drill cuttings will be placed in 55-gallon drum, properly labeled and placed on pallets. The drum placement and disposition will be coordinated with RMRS. Section 5.0 gives additional details regarding waste management activities.

2.5.1.1 Groundwater Monitoring Well Materials

The following sections indicate the specifications of the materials required for the construction of the groundwater monitoring wells. Due to the shallow depths of the wells, centralizers should not be required; however, if centralizers are required, they will be constructed of stainless steel.

Well Casing. The well casing will consist of new, 2-inch schedule 40 flush-joint thread ASTM D 1785 PVC pipe. The fitting will meet the requirement of ASTM F 480 and be flush thread male by female fittings. The well casing and its installation will meet of exceed the requirements in Specification 02671.

Well screen. The well screen will consist of commercially fabricated flush-joint threaded 2-inch Schedule 40 PVC with continuous slots in a non-clogging design. The screen slot size will be 0.010 inch and a screen length of 5 feet. The fitting will meet the requirement of ASTM F 480 and be flush

thread male by female fittings. The well screen and its installation will meet of exceed the requirements in Specification 02671.

Filter Pack. The filter pack will consist of clean, washed, rounded to sub-rounded siliceous material free from calcareous grain and organic matter. The filter pack gradation will be 16-40 with no more than 5 percent by weight smaller than 0.010 inches and a uniformity coefficient no exceeding 2.5. The filter pack and its installation will meet of exceed the requirements in Specification 02671.

Bentonite Seal. The bentonite seal will consist of hydrated, 0.25-inch sodium montmorillonite pellets furnished in sacks or buckets from a commercial source and free of impurities. The bentonite seal and its installation will meet of exceed the requirements in Specification 02671.

Cement-Bentonite Grout. The grout will consist of a maximum of 7 gallons of approved water per bag of Portland Cement and 3 to 5 percent by weight of bentonite powder. The Portland Cement will conform to ASTM C 150. The cement-bentonite grout and its installation will meet of exceed the requirements in Specification 02671.

Concrete Surface Seal and Pad. The cement seal will adhere to ASTM C 150, Type I, air-entrained with aggregate meeting ASTM C 33, resulting in nonshrinking concrete. The concrete and its installation will meet of exceed the requirements in Specification 03300.

Protective Cover. The protective cover will be 6-inch square and 5 feet in length and constructed of steel with a hinged, locking cap. A corrosion resistant metal tag will be fixed to the casing with the well identification number, elevation of the highest point on the rim of the well casing, elevation of the ground surface at the well, well coordinate, date of the well installation and top of the protective casing elevation in feet. The protective cover and its installation will meet of exceed the requirements in Specification 02671.

2.5.1.2 Quality Control for Groundwater Monitoring Well Installation

The following technical submittals will be provided by OHM prior to commencement of work and/or installation of the associated material and submitted to RMRS for review. The submittals required are outlined below:

- Survey coordinates, elevations, and notes
- Documentation and quality control reports
- Permits and/or licenses necessary for the execution of work.

Quality control during installation will involve the verification of grade, installation in accordance with the manufacturer's installation instruction, conformance to the Design Specifications, and overall system integrity. This verification will be conducted utilizing the three phase of inspection. Checklists will be generated prior to initiating this phase of work and will be used to verify compliance throughout completion of the well installation.

Borehole logs will be prepared for each well by the geologist and will contain the following minimum information: name of the project and site; boring/well identification number; location of boring, coordinate; driller; drilling equipment used; date; reference data for all depth measurements; total depth of boring; drilling method and description; stratum changes; stratus description; structural observations; drill fluid status; depth to water; and sample number(s). The geologist and driller will sign the borehole logs.

Installation diagrams will be prepared for each well by the geologist and contain the as-built condition of the well. The diagram will include the following minimum information: project name and site; well identification; driller; installation date; well material description; well depth; hole diameter; depth to

screen and filter pack; depths to seals; elevations/depths/heights of key features of the well; well coordinates; static water level; comments; and surface completion description.

Once the well installation is complete, the as-built installation drawing for each monitoring well prepared by the geologist present during the installation will be submitted. In addition, the well location maps with survey coordinates and elevations will be submitted to RMRS.

2.5.2 Water-level Monitoring Piezometers

Three trench water-level monitoring piezometers will be installed in the collection trench during backfilling operations. Approximate depths to the bottom of the piezometers are seven to fifteen feet below grade. Well materials will consist of one-inch ID schedule 40 PVC flush-threaded casing, with a two-foot length of factory slotted (0.010 inch) casing with bottom cap. The completions will include a bentonite seal of 0.25-inch pellets, cement-bentonite or high-solids bentonite grout, concrete surface pad, protective cover (stick-up design), and a metal identification tag.

The piezometers will be installed through a 4-inch temporary PVC casing as the trench is being backfilled. The bottom of the piezometer screen will be placed six inches from the top of the impermeable seal on the bottom of the trench. Filter pack will be installed in the boring from 0.5 feet below the screen to 1 foot above the predicted high water level in the trench as backfill operations continue. The depth of the top of the filter pack will be directly measured and recorded.

The bentonite seal will be placed from 1.5 feet below the bottom of the impermeable cap and extend 6 inches into the impermeable cap of the trench. The bentonite will be placed in 6-inch lifts and hydrated with water. When the full thickness of the seal has been placed, a minimum of 2 hours will be allowed for complete hydration of the seal before grouting. Grout will be placed in one continuous pour into the annulus above the bentonite seal to the surface. If grout is required, no work will be conducted in the piezometer within 48 hours of grouting.

The steel protective casing will be placed over the riser during the concrete surface seal placement. The concrete surface seal will be allowed to settle prior to pouring the surface pad. The surface pad will be 1 feet in diameter and extend 4 inches above the ground surface and 8 inches below the ground surface.

2.5.2.1 Water-level Monitoring Piezometer Materials

The following sections indicate the specifications of the materials required for the construction of the water-level monitoring piezometers. Due to the shallow depths of the wells, centralizers should not be required; however, if centralizers are required, they will be constructed of stainless steel.

Piezometer Casing. The piezometer casing will consist of new, 1-inch schedule 40 flush-joint thread ASTM D 1785 PVC pipe. The fitting will meet the requirement of ASTM F 480 and be flush thread male by female fittings. The piezometer casing and its installation will meet of exceed the requirements in Specification 02672.

Piezometer screen. The piezometer screen will consist of commercially fabricated flush-joint threaded 1-inch Schedule 40 PVC with continuous slots in a non-clogging design. The screen slot size will be 0.010 inch and a screen length of 2 feet. The fitting will meet the requirement of ASTM F 480 and be flush thread male by female fittings. The piezometer screen and its installation will meet of exceed the requirements in Specification 02672.

Bentonite Seal. The bentonite seal will consist of hydrated, 0.25-inch sodium montmorillonite pellets furnished in sacks or buckets from a commercial source and free of impurities. The bentonite seal and its installation will meet of exceed the requirements in Specification 02672.

Cement-Bentonite Grout. The grout will consist of a maximum of 7 gallons of approved water per bag of Portland Cement and 3 to 5 percent by weight of bentonite powder. The Portland Cement will conform to ASTM C 150. The cement-bentonite grout and its installation will meet of exceed the requirements in Specification 02671.

Protective Cover. The protective cover will be 4-inch round and 5 feet in length and constructed of steel with a hinged, locking cap. A corrosion resistant metal tag will be fixed to the casing with the piezometer identification number, elevation of the highest point on the rim of the piezometer casing, elevation of the ground surface at the piezometer nest, piezometer coordinates, date of the piezometer installation and top of the protective casing elevation in feet. The protective cover and its installation will meet of exceed the requirements in Specification 02671.

2.5.2.1 Quality Control for Water-level Monitoring Piezometer Installation

The following technical submittals will be provided by OHM prior to commencement of work and/or installation of the associated material and submitted to RMRS for review. The submittals required are outlined below:

- Catalog Data for each trench monitoring piezometer screens, casing, riser pipe, filter pack material, bentonite, cement, surface protective covers, and locking cap.
- Documentation and quality control reports
- Permits and/or licenses necessary for the execution of work.

Quality control during installation will involve the verification of grade, installation in accordance with the manufacturer's installation instruction, conformance to the Design Specifications, and overall system integrity. This verification will be conducted utilizing the three phase of inspection. Checklists will be generated prior to initiating this phase of work and will be used to verify compliance throughout completion of the piezometer installation.

The piezometers will be tested to determine the piezometer's ability to respond to water fluctuations and ensure that the piezometer's integrity after installation is intact. The piezometers will be filled with water and measuring the drawdown in the piezometer at specified time increments with a water-level measuring device. The static water level will be measured at the following time increments during the test: 5, 10, 20, 30, 45, 60, 120, 180 seconds and 4, 5, 6, 10 minutes.

Installation diagrams will be prepared for each piezometer by the Design Engineer and contain the as-built condition of the piezometer. The diagram will include the following minimum information: project name and site; piezometer identification; name of individual preparing the diagram; installation date; piezometer material description; piezometer depth; hole diameter for bentonite and grout seal; depth to screen and filter pack; depths to seals; elevations/depths/heights of key features of the piezometer; piezometer coordinates; static water level; comments; and surface completion description.

Once the piezometer installation is complete, the as-built installation drawing for each piezometer prepared during the installation will be submitted. In addition, the piezometer location maps with survey coordinates and elevations will be submitted to RMRS.

In the event that a piezometer needs to abandoned due to improper installation, it will be abandoned in accordance with the requirements of the State of Colorado and the Specifications. Records will be maintained as piezometer abandonment activities are conducted. These records will contain the following minimum information: project name; piezometer number; piezometer location, depth and diameter; date of abandonment; method of abandonment; material utilized in abandonment; casing or items left in the hole; description and quantity of grout used; description and quantities of grout used daily to compensate for settlement; water or mud level prior to grouting and date measured; and reason for abandonment.

2.5.3 Abandonment

Up to 11-temporary geoprobe wells may have to be abandoned. The geoprobe wells were installed in 1997 to characterize the soil and groundwater for placement of the barrier wall collection system. The wells are constructed of 1-inch PVC casings. The 2-inch diameter PVC protective top casing which is set to approximately 1.5 feet below ground surface, will be pulled, and the well casings will be filled with 0.25-inch bentonite pellets hydrated in two-foot lifts as described in the Rocky Flats well abandonment SOP. Some of these wells are located in the trench alignment and will potentially be excavated. These wells will not be abandoned. The PVC removed during the excavation will be segregated from the material removed.

Records will be maintained as well abandonment activities are conducted. These records will contain the following minimum information: project name; well number; well location, depth and diameter; date of abandonment; method of abandonment; material utilized in abandonment; casing or items left in the hole; description and quantity of grout used; description and quantities of grout used daily to compensate for settlement; water or mud level prior to grouting and date measured; and reason for abandonment.

2.6 Work Area Restoration

Work area restoration will involve final grading, topsoil replacement, and seeding. Prior to initiating seeding, certificates of compliance certifying that materials meet the requirements in Specification 02935 and certified reports including the percent of live seed, minimum percent germination and hard seed, maximum percent weed seed content, date tested, and state certification will be submitted to RMRS.

Topsoil previously stockpiled during grubbing and excavation activities will be uniformly replaced to an approximate depth of 6 inches. The topsoil, once replaced, will be back dragged to smooth out the area and prepare for revegetation. Topsoil finished surface will be reasonably smooth, compacted, and free from irregular surface changes to the degree obtainable from blade operations. Following topsoil placement and preparation, the topsoil tilled to a minimum depth of 6 inches.

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The seed mixture will be a State approved seed of the latest season's crop with less than 1- percent weed seed. The seed will be inspected upon arrival to the job site for conformance with the specifications and stored in a cool dry location until placement. The standard seed mixture shall consist, and be applied at a rate of, the following:

Big Bluestem	8 lbs/acre
Little Bluestem	8 lbs/acre
Western Wheatgrass	12 lbs/acre
Sideoats Gamma	8 lbs/acre
Blue Grama	8 lbs/acre
Blue Flax	4 lbs/acre
Buffalo Grass	8 lbs/acre

The seeding and fertilizer shall be applied by broadcast seeding and crimping methods. It is not anticipated that disturbed areas will occur on slopes that will require erosion control measures (i.e., blanket, etc.). Half of the seed will be broadcast in one direction, and the remainder of the seed at right angles to the first direction. After seeding, the area will be covered with ¼ to ¾ inch of soil by disk barrow, steel mat drag, culipacker or other approved method. Finally, the area will be rolled with a roller that does not exceed 90 pounds per each foot of roller width. Straw or hay mulch will be spread at a rate of 2 tons per acre and mechanically anchored with a V-type wheel landpacker. The straw and/or hay will be free from weeds and in air-dry condition and suitable for placing with blower equipment.

2.7 Demobilization

Upon completion of construction activities, heavy equipment will be demobilized from the project site, trailers, storage units prepared for transportation, and supplies removed from the site. Construction equipment will be cleaned by pressure washing, broom cleaning, or a combination of cleaning methods. The goal of this work is to prevent tracking debris or soil out of the ETP Site. Rental equipment will be returned in good condition.

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3.0 PROJECT SUPPORT ACTIVITIES

Details of project support activities are presented in the following sections.

3.1 Quality Assurance/Quality Control

Incorporated within this document is a construction quality control (CQC) plan for the installation. Specific inspection tasks, which are the responsibility of the installation contractor (OHM) or its subcontractors have been presented in previous sections. The ETPTS construction will be conducted in accordance with the OHM *Quality Assurance Program Plan*. Due to the scope of activities associated with this task, all 10 of the criteria apply to the scope of work. The Design Engineer, Mr. Kent Friesen, will also act as the Construction Quality Control (CQC) Supervisor. As such, Mr. Friesen will complete the three phases of inspection for each definable feature of work, inspect items as they are delivered to the site, inspect installation prior to backfilling, and document daily QC activities through the Daily QC Report.

A major purpose of the CQC process is to provide documentation for those individuals who were unable to observe the entire construction process (e.g., representatives of the permitting agency) so that those individuals can make informed judgments about the quality of construction for a project. Specific documentation requirements of the installation contractor (OHM) and its subcontractors are presented in the following sections. All such documents will be submitted to RMRS and included in the administrative record.

3.1.1 Inspection and Testing Reports

All observations, results of field tests, and results of laboratory tests performed on site or off site shall be recorded on a suitable data sheet. Recorded observations may take the form of notes, charts, sketches, photographs, or any combination of these. Where possible, a checklist may be useful to ensure that pertinent factors are not overlooked. As a minimum, the inspection data sheets shall include the following information:

- Description or title of the inspection activity;
- Location of the inspection activity or location from which the sample was obtained;
- Type of inspection activity and procedure used (reference to standard method when appropriate or specific method described in FIP);
- Unique identifying impermeable barrier membrane sheet number for cross-referencing and document control;
- Recorded observation or test data;
- Results of the inspection activity (e.g., pass/fail); comparison with specification requirements;
- Personnel involved in the inspection besides the individual preparing the data sheet.

The Preparatory, Initial and Follow-up Inspection checklists will be completed prior to initiating a definable feature of work. The definable features of work for the ETPTS are:

- Excavation, Backfill and Grading of Collection Trench
- Excavation, Trenching, and Backfilling for Treatment System and French Drain
- Subdrainage System for Collection Trenches
- Geomembrane Vertical Barrier
- Separation/Filtration Geotextile
- Treatment System Piping
- Groundwater Monitoring Wells and Geoprobe Abandonment
- Water-Level Monitoring Piezometers
- Metering Manholes, Collection Sumps, and Treatment Cells
- Turf
- Concrete

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- Railings and Bollards
- Flow Measuring Equipment

3.1.2 Problem Identification and Corrective Measures Reports

A problem is defined as any material or workmanship that does not meet the requirements of the plans, specifications or FIP for the project or any obvious defect in material or workmanship, even if there is conformance with plans, specifications and the FIP. As a minimum, problem identification and corrective measure reports shall contain the following information:

- Location of the problem;
- Description of the problem (in sufficient detail and with supporting sketches or photographic information where appropriate) to adequately describe the problem;
- Unique identifying serial or identification numbers (if applicable) for cross-referencing and document control;
- Root cause;
- How and when the problem was located (reference to inspection data sheet or daily summary report by inspector);
- Where relevant, estimation of how long the problem has existed;
- Any disagreement noted by the inspector between the inspector and contractor about whether or not a problem exists or the cause of the problem;
- Suggested corrective measure(s);
- Documentation of correction if corrective action was taken and completed prior to finalization of the problem and corrective measures report (reference to inspection data sheet, where applicable);
- Suggested methods to prevent similar problems, if appropriate.

3.1.3 Drawings of Record

Drawings of record (also called "as-built" drawings) shall be prepared to document the actual lines, grades, and conditions of each component of the ETPTS. The record drawings shall include logistic data for a particular component, the plan dimensions of the component, and locations of any test samples acquired during installation of the ETPTS. For impermeable barrier membrane components, the record drawings shall show the dimensions of all membrane field panels, the location of each panel, identification of all seams and panels with appropriate identification numbering or lettering, location of all patches and repairs, and location of all destructive test samples. Separate drawings may be needed to show record cross sections and special features such as monitoring portal locations.

3.2 Meetings

Communication is extremely important to quality management. Quality construction is easiest to achieve when all parties involved understand clearly their responsibility and authority. Meetings can be very helpful to make sure that responsibility and authority of each organization is clearly understood. During construction, meetings can help to resolve problems or misunderstandings and to find solutions to unanticipated problems that have developed.

3.2.1 Preconstruction Meeting

The preconstruction meeting will be held immediately before construction is started, including representatives of RMRS, OHM, subcontractors, and key material suppliers. The purpose of this meeting is to review the details of the FIP, to make sure that the responsibility and authority of each individual is clearly understood, to agree on procedures to resolve construction problems, and to establish a foundation of cooperation in quality management.

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It is very important that the procedures for inspection and testing be known to all, that the criteria for pass/fail decisions be clearly defined (including the resolution of test data outliers), that all parties understand the key problems that the CQA personnel will be particularly careful to identify, that each individual's responsibilities and authority be understood, and that procedures regarding resolution of problems be understood.

3.2.2 Progress Meetings

Weekly progress meetings shall be held. Weekly meetings can be helpful in maintaining lines of communication, resolving problems, identifying action items, and improving overall quality management. When numerous critical work elements are being performed, the frequency of these meetings can be increased to biweekly, or even daily. Persons who should attend this meeting are those involved in the specific issue(s) being discussed. At all times the OHM Superintendent, Project Manager, or designated representative, should be present.

Daily plan of the day meetings shall be conducted to discuss work to be performed for that workday. Health and safety issues shall be emphasized daily and problem resolution will be determined and discussed as required during installation on the ETPTS.

3.3 Sample Custody

Soil and groundwater sampling is not required for this project. If a sample is requested and taken, a chain of custody record shall be made for that sample. If the sample is transferred to another individual or laboratory, records shall be kept of the transfer so that chain of custody can be traced. The purpose of keeping a record of sample custody is to assist in tracing the cause of anomalous test results or other testing problems, and to help prevent accidental loss of test samples.

3.4 Weather

Weather can play a critical role in the installation of the ETPTS. Installation is particularly sensitive to weather conditions, including temperature, wind, humidity, and precipitation. The installation subcontractor (OHM) is responsible for complying with the contract plans and specifications (along with the CQC plans for the various components of the system). It is the responsibility of the contractor or installer to make sure that these weather restrictions are observed during construction.

3.5 Work Stoppages

Unexpected work stoppages can occur due to a variety of causes, including labor strikes, contractual disputes, weather, QC/QA problems, etc. When stoppages occur, the installation contractor (OHM) and its subcontractors will attempt to ensure that (1) in-place materials are covered and protected from damage; (2) partially covered materials are protected from damage; and (3) manufactured materials are properly stored and properly or adequately protected. The cessation of construction should not mean the cessation of inspection and documentation.

3.6 Permitting

It is anticipated that installation of the ETPTS at this site can be done under existing agreements between the site owners and the State of Colorado regulatory agencies, and that no additional permits will be required. Permits to construct monitoring wells will be submitted to the State Engineers Office.

3.7 Construction Health and Safety Plan

This task includes a safety and health review, which will be conducted concurrently with the preliminary design review. A HASP has been written for the ETP and will be approved before activities can be started at the site.

3.8 Post-Construction Submittals

Once construction and demobilization is complete, post-construction activities will be initiated. Post-construction activities include preparation of closeout submittals. Within 30 days of project completion, the following records will be transmitted to RMRS:

- As-built drawings
- Chain-of-custody forms
- Field and Laboratory calibration records
- Survey reports
- Forms completed from Standard Operating Procedures
- Training and qualification records
- Permit compliance reports
- Concurrence reports
- Maps
- Photographs
- Electronic media
- Quality Assurance addenda
- Logbook/Field Notes maintained by the designated Health and Safety Representative
- Copies of all daily pre-work briefings
- Final copy of OSHA 200 Log
- All health and safety-related documentation including monitoring results and employee notification forms.

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4.0 WASTE MANAGEMENT

Soils considered to be potentially affected will be stockpiled on the area where the topsoil had been removed and within the trench area.

Soils meeting the type considered for trench cap will be segregated. All soil will be field screened using a photoionization detector (HNU), as soils are excavated. Any soils containing detectable concentrations of VOCs shall be handled as potentially contaminated and properly evaluated for handling. All excess soil generated will be graded over the trenched area and revegetated. There will be no soil generated, which will require disposal.

Soil generated as a result of installing the monitoring wells will either be raked out on site or drummed as required by RMRS SOP's.

During construction of the barrier wall, it will not be necessary to pump groundwater from the saturated zone soils out of the excavation. Based on groundwater information collected to date, it is assumed that there will not be an appreciable quantity of water accumulation in the excavation during the time that it is estimated to excavate and backfill the trench. If the water that accumulates in the trench does need to be removed due to the inability to construct the collection trench as designed, then water will be pumped into a temporary holding tank and transported to the RMRS treatment system for disposal.

PPE generated during the construction activity will be placed in bags and staged for disposal by RMRS.

4.1 Spill Prevention and Control

The ETPTS Project, company, contractor, and subcontractor personnel are required to call the Plant Shift Superintendent's Office (PSS) at 966-2914 or by radio and report any spill or any incident with potential adverse environmental, health, or safety effects. The employee discovering/causing the incident has the responsibility to report it to the PSS and his/her supervisor immediately. This responsibility must be communicated to all employees working on the ETPTS Project.

The Site Spill Prevention Program requires that all possible precautions be taken to minimize the likelihood of a spill. Guidelines for design and construction of hazardous material storage tanks (e.g., fuel tanks, chemical tanks, etc.) and secondary containment are specified in *Design Standards for Hazardous/Toxic Waste and Material Storage Tanks, Dikes and Transfer Stations, (4)* Y/TS-104. At this time, it is not anticipated that this project will involve materials that would require Y/TS-104 standards.

Any fuel storage tank(s) of greater than 100-gallon capacity are required to be diked to minimize the probability of any release to the watershed. All containers over five gallons are required to be labeled with the appropriate Hazardous Identification Label (diamond) as identified in the National Fire Protection Association Code (NFPA-704) (5).

All heavy equipment and mechanical equipment will be maintained in good repair so as to minimize the release of engine, transmission, or other oils through slow leaks. Idle equipment will be parked as far away from streambeds as practical. At the request of the company representative, a drip pan provided by the contractor will be used under contractor equipment that is leaking excessively.

Fueling operations will be performed with care, and allowances will be made for fuel expansion to prevent inadvertent small releases. Fuel tanks will be contained within temporary dikes and inspected regularly. Fuel, lubricant, or coolant spilled by contractors, if any, will be cleaned up daily,

placed in appropriate containers, and disposed of in accordance with RMRS operations procedures, communicated by the Project Manager.

There is a plant-wide contingency plan in the event that an emergency evacuation of the plant is required. It is the employer's responsibility to provide emergency signal and procedure information to his/her employees.

If a spill occurs at the ETPTS Project, all safe, practical methods available will be used to prevent material from entering streams, ponds, or springs. (Spill response kits containing sorbent material will be provided by the company representative during construction. Sorbent pillows, temporary earth dikes, or other means will be readily available on-site and be used as appropriate without risking personnel safety.

4.2 Good Housekeeping Practices

All personnel present at the ETPTS Project site will observe good housekeeping practices at all times. Paper trash and refuse will be collected, contained and disposed at the site on a daily basis. No unpermitted wastewater of any type will be discharged on-site. All rinse water containing additives of any sort (e.g., soap, degreasers, cleaning agents. etc.) will be collected, contained, and disposed in accordance with the appropriate plant waste disposal procedures. Trucks hauling material on- and off-site will not be overfilled. Loose debris will be contained within the vehicles to prevent littering of highways and haul roads. Brush, construction debris, and trash will be removed from drainage ways and streams.

Fueling operations will be conducted so that small (de minimis) fuel/oil releases are contained and cleaned up daily. Appropriate precautions are to be taken to minimize discharge of fuel, coolants, oil, lubricants, grease, and other hydrocarbons.

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5.0 PROJECT SUBMITTALS

Project submittals as outlined in Section 2.0 will be the responsibility of Design Engineer. The Design Engineer will review all submittals prior to submission to RMRS. Submittal requirements are outlined in the Design Specifications.

5.1 Administration and Site Indirect

The management of the site will be the responsibility of the OHM Superintendent under the direction of the Project Manager. The Superintendent will continuously monitor the project's costs and schedule, and inform RMRS and OHM's Program Office of any variances in cost or schedule.

5.1.1 Operation and Maintenance Manual

A brief operation and Maintenance Manual (O&M Manual) will be prepared. The O&M manual will provide a method- and site-specific manual describing all aspects of system operation. The system is designed requiring a minimal amount of O&M.

5.2 Health and Safety Plan

A HASP has been written for the ETP and will be approved before activities can be started at the site. The HASP or amendments to the HASP will include a hazard analysis for each portion of the process train to ensure that associated activities of excavation and backfilling operations are performed safely. The hazard analysis will focus on potential hazards to operators, people outside of the operation, and impact to the local environment. The results from this analysis will determine what level of hazard assessment will be necessary; at this time, it is expected that a low-level hazard assessment will result. The HASP will also identify the applicable state and federal compliance requirements specific to the project.

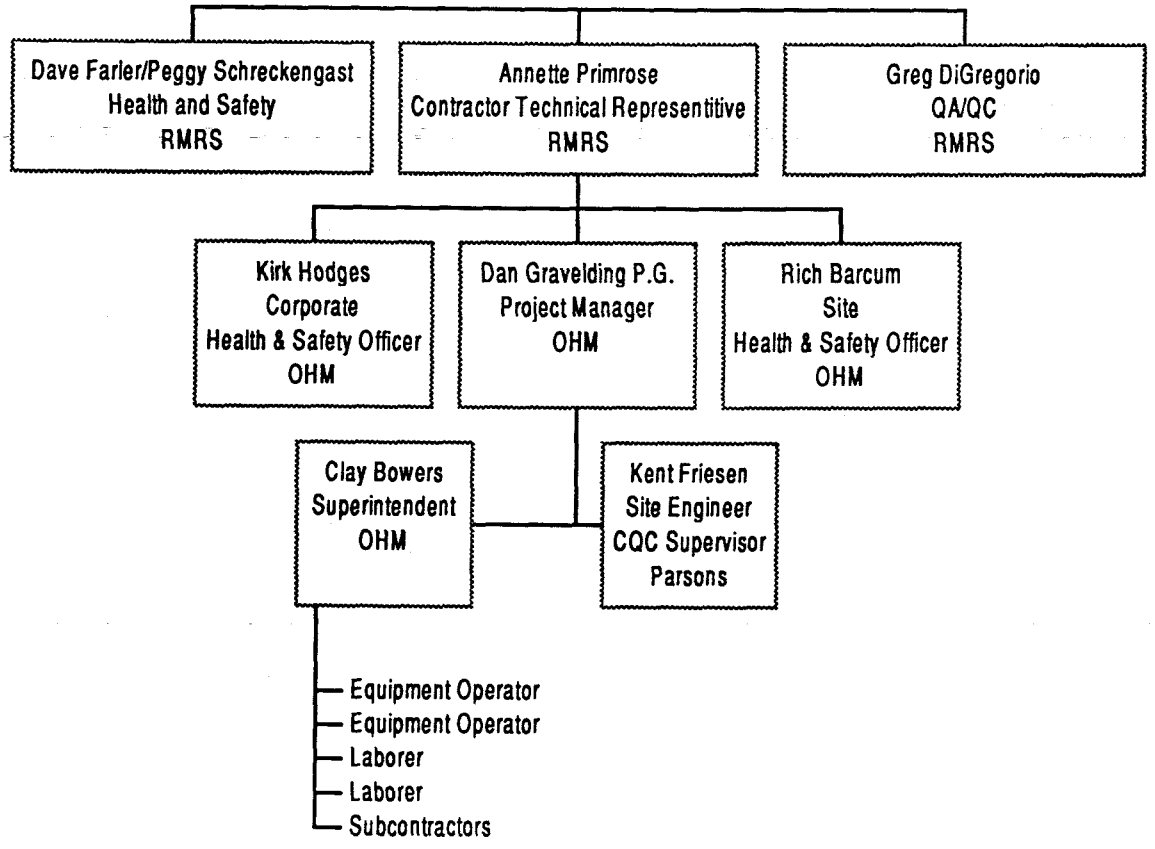
6.0 REFERENCES

Parsons, 1998. *East Trenches Plume Project Drawings*, November.

Parsons, 1998. *East Trenches Plume Project Specifications*, November.

RMRS, 1998, *Draft Proposed Action Memorandum for the East Trenches Plume*, RF/RMRS-98-258.UN, September.

Figure 1
East Trench Plume Organization Chart



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Project No 777398
November 1998

DRAFT CONSTRUCTION HEALTH AND SAFETY PLAN FOR THE EAST TRENCH PLUME PROJECT

Prepared For:

Rocky Mountain Remediation Services
Rocky Flats Environmental Technology Site
PO Box 464
Golden, Colorado

Prepared By:

OHM Energy Services
5600 South Quebec Street, Suite 200B
Englewood, Colorado 80111

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Project Name: East Trench Plume Project
HASP Title: Construction Health & Safety Plan
Project Number: 777398

DECLARATION OF UNDERSTANDING

I have read and understand this Task-Specific Health and Safety Plan (HASP) and agree to abide by the procedures and limitations specified here and in the OHM "Safety Rules for Contractors."

Name	Signature	Employer	Employee No.	Date

Notes:

1. All personnel signing above must appear in Part G - Personnel Categorization.
2. All contractors to OHM must abide by the specifications and limitations contained in this HASP.
3. All OHM and OHM subcontractor personnel working on this task must review and sign this HASP before starting fieldwork on site.
4. This HASP is to be used in conjunction with the Tailgate Safety Meeting form, OHM Employee Health & Safety Work Rules, and OHM General Safety Rules for Contractors.

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FIELD CHANGES

Change Topic	Other Documents Affected	Approvals Obtained	Effective Date
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			

Construction Health & Safety Plan for the East Trench Plume Project

SIGNATURE PAGE

Reviewed and approved by:

RMRS Project Manager _____ Date

RMRS Radiological Engineer _____ Date

RMRS Health and Safety _____ Date

OHM Health and Safety _____ Date

OHM Project Manager _____ Date

OHM Industrial Hygienist _____ Date

OHM Project Manager _____ Date

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FIGURES

TABLES

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ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
CCl_4	Carbon Tetrachloride
CFR	Code of Federal Regulations
HASP	Construction Health and Safety Plan
CRZ	Contamination Reduction Zone
CTR	Contractor's Technical Representative
dB	Decibels
DOE	Department of Energy
EC	Emergency Coordinator
ESH	Environmental Safety and Health
ETP	East Trench Plume
ETPTS	East Trench Plume Treatment System
EPA	U.S. Environmental Protection Agency
EZ	Exclusion Zone
FIP	Field Implementation Plan
FTL	Field Team Leader
HAZMAT	Hazardous Material
HDPE	High Density Polyethylene
HSO	Health and Safety Officer
IH	Industrial Hygienist
IHT	Industrial Hygiene Technician
MSGP	Mound Site Groundwater Plume
MSDS	Material Safety Data Sheet
MSP	Medical Surveillance Program
MSPP	Mound Site Plume Project
MSPTS	Mound Site Plume Treatment System
NFPA	National Fire Protection Association
OHM	OHM Energy Services
OMP	Occupational Medical Program
OSHA	Occupational Safety and Health Administration
OU	Operable Units
PCE	Tetrachloroethlene
PID	Photo Ionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RCA	Radiological Control Area
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RFETS	Rocky Flats Environmental Technology Site
RFP	Rocky Flats Plant
RMRS	Rocky Mountain Remediation Services, L.L.C.
ROI	Radiological Operation Instructions
OP	Standard Operating Procedure
TCE	Trichloroethene
TLV	Threshold Limit Values
TWA	Time-weighted Average
VOC	Volatile Organic Compound

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1.0 INTRODUCTION

The East Trench Plume Project (ETP) will employ reactive iron technology for the remediation of the east trench groundwater plume at the Rocky Flats Environmental Technology Site (RFETS) (Figure 1-1). The East Trenches Plume remediation project is authorized as an accelerated action under the East Trenches Plume Proposed Action Memorandum (PAM) (DOE 1998). The reactive iron technology recently implemented at the Mound Site Plume will be used to treat groundwater containing chlorinated organic compounds at the East Trenches.

The East Trenches Plume (ETP) contains chlorinated organic contamination in excess of action levels defined in Attachment 5 to the Rocky Flats Cleanup Agreement (RFCA) (DOE 1996). This construction health and safety plan (HASP) establishes the procedures and requirements that will be used to minimize health and safety risks to persons involved with the construction of the reactive barrier for the ETP. The plan contains information about the hazards involved in performing the tasks and the specific actions and equipment that will be used to protect persons working at the ETP during installation of the East Trenches Plume Treatment System (ETPTS).

This HASP will govern all work at ETP performed by employees and its subcontractors of OHM Energy Services, (OHM), and employees of other companies. Persons not normally assigned to work at the task site (e.g., representatives of DOE, the State of Colorado, Occupational Safety and Health Administration (OSHA), delivery/truck drivers and EPA) will be considered non-workers and will fall under the definition of occasional Site workers as stated in OSHA 29 Code of Federal Regulations (CFR) 1926.65.

This HASP complies with applicable Occupational Safety and Health Administration (OSHA) and the U.S. Environmental Protection Agency regulations. This HASP follows the guidelines established in the following:

- Standard Operating Safety Guides (U.S. EPA, June 1992).
- Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities (NIOSH, October 1985).
- Title 29 of the Code of Federal Regulations, Part 1926.65, U.S. Department of Labor/OSHA.
- OHM Health and Safety Policies and Procedures Manual, 9000 and HS Series.

1.1 Task Site Description

The East Trenches Plume Site is located north of Central Avenue and east of the RFETS Protected Area, and east of the Mound Site (Figure 1-2). The East Trenches were used between 1964 and 1967 for the disposal of sanitary sewage sludge contaminated with low levels of uranium and plutonium. The trenches are also known to have contained VOCs, crushed drums, and miscellaneous waste. In 1996, these trenches were excavated as part of an accelerated source removal action. The removed soil and debris were treated by thermal desorption to remove the VOCs, primary carbon tetrachloride, trichlorethene, and tetracloroethene. The treated soil below Tier II action levels was returned to the trench excavation and the area was revegetated. Some radiologically contaminated soils between Tier I and Tier II levels were wrapped in geotextile material for ease of future identification, and returned to the T-4 excavation.

1.1.1 Existing Information and Characterization Data

The East Trenches Plume Site is located near South Walnut Creek. Past investigations determined that the distal end of extends from the vicinity of boring 22597 to boring 23597. The investigation also determined that areas within the plume were dry or did not produce groundwater. The colluvium and bedrock were determined to consist primarily of claystone with some interbedded sandstone. Slope failure occurred during installation of the Mound Plume groundwater collection system.

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Figure 1-1. Map of RFETS.

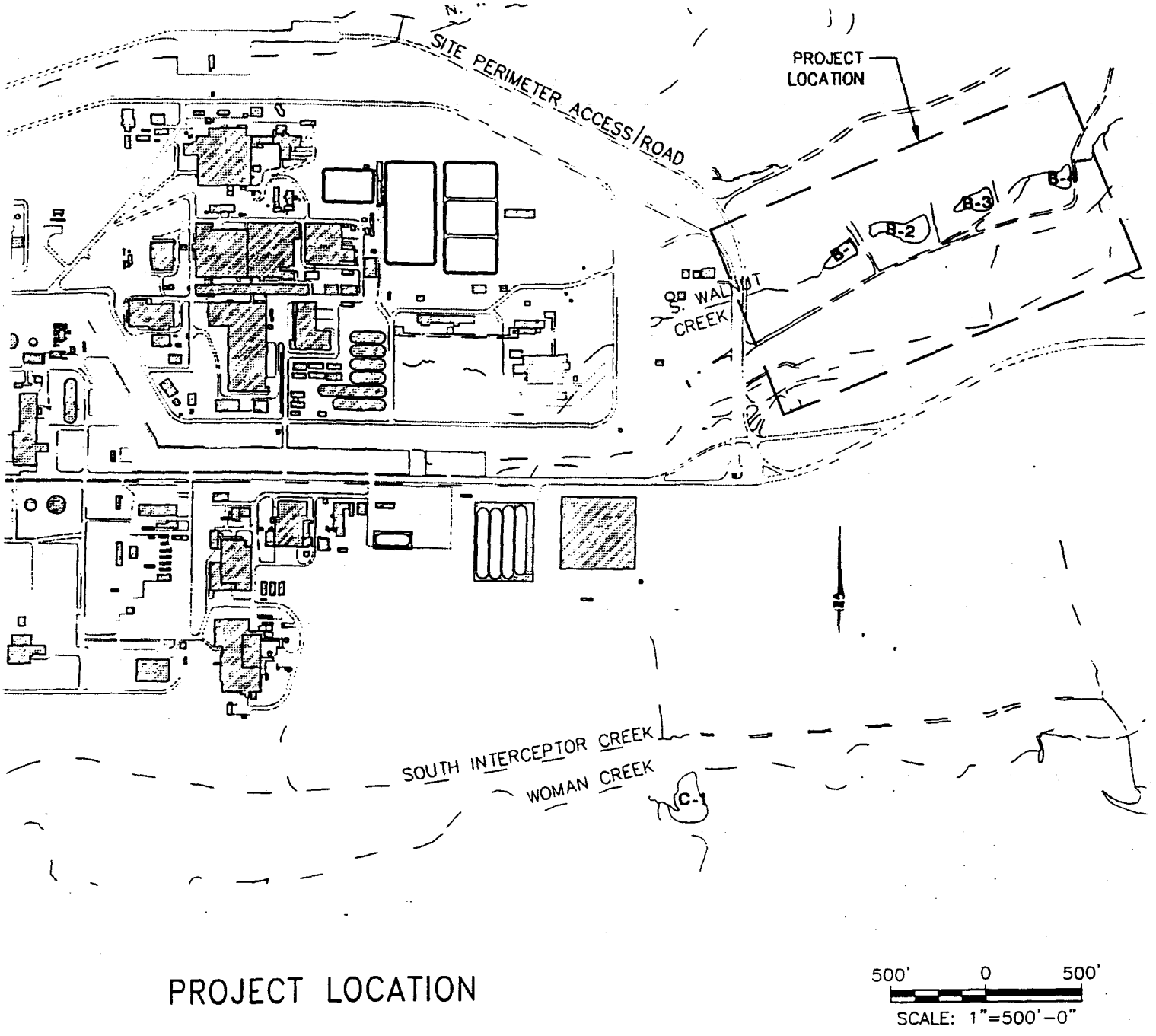

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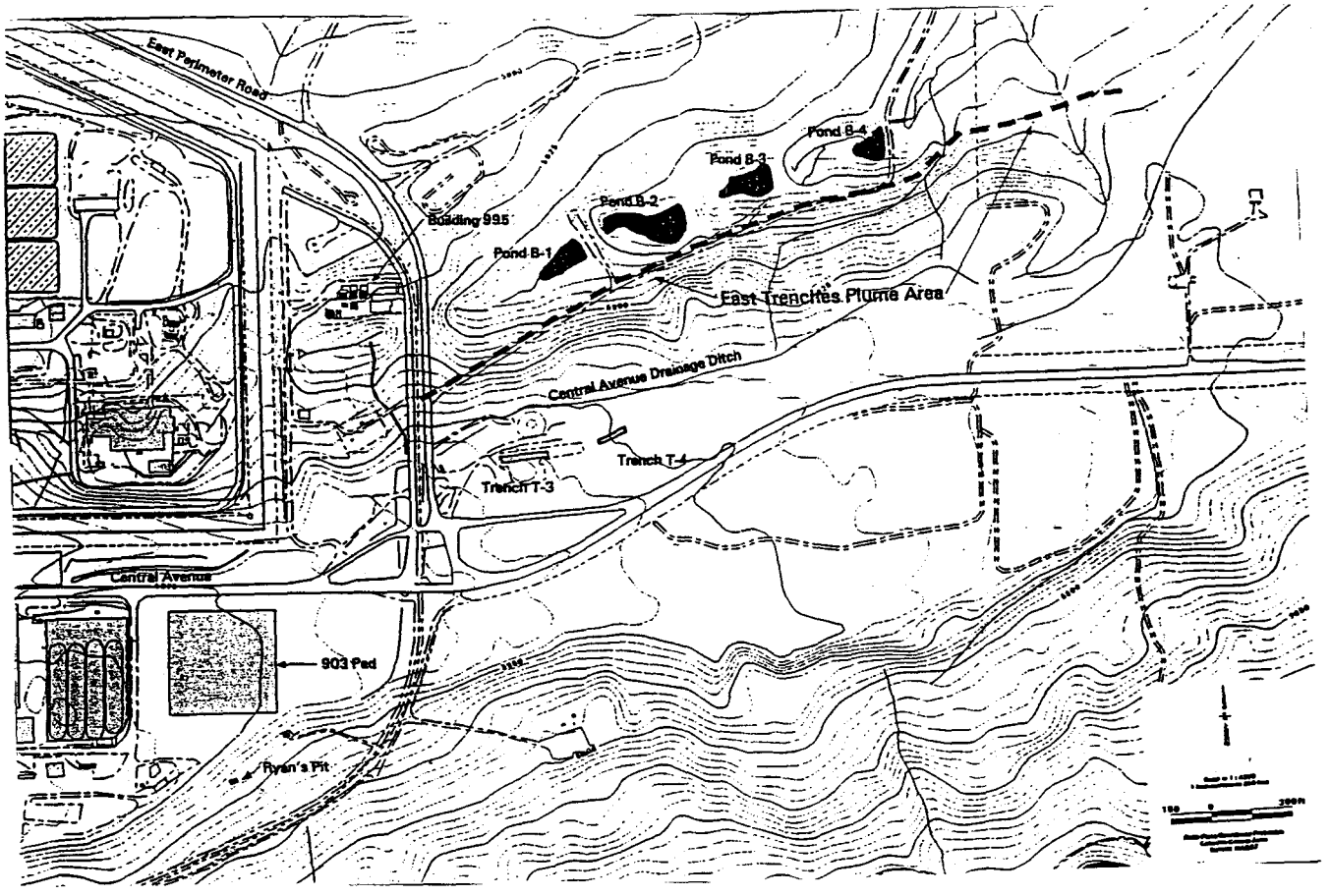
Figure 1-2. Location of East Trenches Plume Project



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Similar conditions are anticipated during installation of the East Trenches. Depth to groundwater is approximately fifteen feet at the East Trench Site (within the weathered bedrock). Unconsolidated materials are dry much of the year, but groundwater can fluctuate up to approximately six feet below ground surface. Groundwater levels near South Walnut Creek are typically three to eight feet below ground surface.

1.1.2 Previous Investigations

A pre-remedial investigation was conducted in the fall of 1997 and spring of 1998 to determine the extent and configuration of the East Trenches Plume near South Walnut Creek. Geoprobe borings were advanced at the East Trenches plume as part of the RFETS.

The geoprobe borings were located at 100 foot intervals along a southwest-northeast alignment immediately north of the road on the south bank of South Walnut Creek, above Ponds B-1 and B-2. Follow-on work was conducted in spring 1998 to define the contaminated groundwater plume sufficiently to design a remedial action. Results from this investigation are presented in Table 1-1.

As a result of the combined investigation, thirty-two geoprobe holes were pushed, at approximately 100-foot spacing perpendicular to the path of the East Trenches plume in order to define the nature and extent of contamination in groundwater in the distal end of the plume. Twenty-five temporary wells were installed to define the nature and extent of contamination in the groundwater in the distal end of the plume. For all wells containing sufficient water, water levels were measured and groundwater samples were collected and submitted for both radiological screening and VOC analysis.

1.2 Scope of Work

The ETPTS involves the installation of a reactive iron system for collection and treatment of the ETP. The ETPTS consists of a subsurface barrier, a long-term monitoring system, and a treatment system including treatment media identified in development studies. The following sections briefly review the procedures for installing the ETPTS. Details of system installation can be found in the Field Implementation Plan. Work associated with this project will be performed during daylight hours, Monday through Friday from 0730 to 1700.

1.2.1 Mobilization

OHM will mobilize the field crew, health and safety materials, vehicles, and small equipment primarily from the office in Denver, Colorado. All heavy equipment, support equipment, and subcontractor services will be obtained from vendors in the local area. Key personnel for the project include the Project Manager, Health and Safety Officer (HSO), and Construction Site Supervisor (Superintendent), and field technicians.

Table 1-1 Groundwater Analytical Data (micrograms per liter)

Contaminant	Tier II Action Levels	Geoprobe-well location								
		22597	22697	22797	22897	22997	23097	23197	23397	23597
Vinyl Chloride	2									
cloroethane										
Acetone										
1,1,Dichloroethene	7	< 1	< 1	< 1	< 1	9	< 1	< 1	< 1	< 1
1,1, Dichloroethene	1010									
1,2, Dichloroethene	5									
cis-1,2 Dichloroethene	70									
trans-1,2 Dichloroethene	70									
1,1,1-Trichloroethane	200									
1,1,2-Trichloroethane	200									
Carbon Tetrachloride	5	12	7.1	95	20	460	280	140	69	64
Benzene										
Chloroform	100	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
Trichloroethane	5									
Tetrachloroethene	5	250	730	580	83	440	320	190	37	17
Methylene Chloride	5	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1

nd = Not detected

1.2.2 Site Preparation

Prior to initiating construction operations, the following site preparation activities will be performed:

1. Site-specific training will be required for all site personnel and site badges will be secured.
2. All site personnel will provide certificates of OSHA training.
3. A pre-construction meeting will be held with all project personnel. The meeting consists of an explanation of DOE procedures, points of contact throughout site activities, and review of the HASP (See Section 2).
4. The final Field Implementation Plan will be submitted for review and approval.
5. Necessary work permits will be obtained in coordination with RFETS personnel (i.e., fire department, excavation, building and zoning, plumbing, electrical, and environmental).
6. Temporary facilities such as storage trailers, sanitary facilities, parking areas, personnel and equipment decontamination areas, areas for storage of construction materials, and areas for staging (containing) construction wastes will be established. Radio and/or cellular phones will be used on-site.
7. Site security will be established and will consist of temporary construction barrier tape. Traffic control measures will be established.
8. Access and haul routes will be identified for material deliveries and construction activities.
9. Work zones will be established in accordance with the HASP (Section 4).

1.2.3 Site Survey

The barrier wall alignment and the treatment system locations will be surveyed prior to performing any intrusive activities. Control points will be established outside the work area and referenced during installation of the ETP to ensure all elevations are per the design specifications. There will be no intrusive activities performed as part of the site survey task.

1.2.4 Excavation Activities

A minimum of 12 inches of surface soils will be scraped from the work area. Topsoil will be stockpiled and segregated from other soils for reuse as top cover.

Three 48-inch collection sumps will be located on the up gradient side of the barrier wall. The collection sumps will be engineered so that they classify structurally as a confined space to allow personnel entry for service or maintenance. An area approximately five feet by seven feet will be excavated and shored if required for construction using an approved shoring system. Prior to lowering the collection sump into place approximately two feet of crushed stone will be placed at the bottom of the excavation. The collection sump will be backfilled with the same backfill material used in the trench. Entry into the shored excavation will be limited and managed to avoid entry if possible. When entry is required, it will be done in accordance with all applicable confined space entry rules and regulations. All penetrations through the sump for the collection and effluent piping will be thermally welded to ensure that all connections are watertight.

Open-cut trenching is anticipated to be used to install the barrier wall and groundwater collection piping. The trench will be excavated to the desired depth along the length of the barrier wing walls. All excavation work will be performed following the requirements of 29 CFR 1926, Subpart P and HSP 12.08 excavations and trenching. This includes the requirements that excavations be supervised and inspected by a designated individual qualified as an OSHA competent person in excavation safety. Appropriate set backs equal to 6 feet from the edge of all unsupported excavations will be established. Workers required to perform work inside these set backs will be required to wear fall protection. Fall protection will consist of a harness and lanyard system connected to a support cable running parallel to the trench. Work conducted at the edge of the trench will be performed on scaffolding at least 12 feet long, to avoid employee contact with the edge of the trench. To the extent possible any work that is required within the 6 foot set back will be performed from a man lift.

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The excavation for the treatment system will be constructed with the sides of the excavation cut to 1½ (horizontal) to 1 (vertical) slope. Personnel entering the excavation will do so in accordance with OSHA 1910/1926, and Section 7.3.6 of this document for confined space entry. Care will be taken to excavate only what is necessary to safely install the ETPTS.

1.2.5 Trench Backfill

The following media are required to be installed in the trench: bentonite, select material, HDPE perforated pipe, HDPE sheet barrier, geofabric, and native backfill cap material. The HDPE barrier wall is the first to be inserted into the open trench excavation. The barrier panels will be placed using two boom trucks or light duty (25-ton) cranes. Proper hand signals and crane and rigging safety will be observed during placement of the barrier wall panels. The geomembrane will be draped next to the barrier wall panels once the entire barrier wall is in place. Up to two feet of bentonite will go into the excavation once the barrier panels and the geomembrane are in place. The bentonite will be placed using super sacks lifted by the crane. Two tag lines will be used to guide the bags into position and direct the bentonite into the trench. Following placement of the bentonite the select material will be placed in to the excavation using the excavator bucket. During placement of all materials the set backs discussed in Section 1.3.4 will be observed, workers required to perform work inside these set backs will be required to wear fall protection.

1.3 Regulations and Guidelines

These safety and health requirements will apply to all Contractors performing construction work under direct contract or subcontract at the RFETS. The Kaiser Hill, LLC has overall obligation for compliance with 29 CFR 1910 and 29 CFR 1926. However, RMRS, and OHM, with Kaiser Hill, LLC approval, may make their own arrangements with respect to obligations which might be more appropriately treated on a job site basis, (e.g., first aid, toilet facilities, etc.) with their Lower-tier Subcontractors or Vendors. OHM assumes compliance to this section for their portion of the project and assures compliance of any Lower-tier Subcontractors or Vendors they may employ. OHM and all Lower-tier Subcontractors and Vendors will be subject to enforcement of these requirements. Variances from published codes shall be in accordance with OSHA Title 29 CFR 1905, Section 1700 and DOE Orders. Safety requirements for construction activities at the Site are mandated by applicable DOE Orders, OSHA Standards and Regulations, and 1 -CI 8-HSP 24.01 "Safety and Health Responsibilities for Construction Activities of the Site Health and Safety Practices Manual." All Contractors and Subcontractors must meet pre-qualification requirements of the Kaiser Hill, LLC before being allowed to perform construction work at the Site.

OHM and all Lower-tier Subcontractors and Vendors will take all reasonable precautions in the performance of the work to protect the safety and health of employees and others, and to protect property, the environment, and will comply with applicable federal, state, and local codes and regulations for safety and health, including but not limited to:

A. Contract Work Hours and Safety Standards Act of 1969 and subsequent amendments. OSHA 29 CFR 1926 - Safety and Health Regulations for Construction.
B. Public Law 91-596, Occupational Safety and Health Act of 1970 and subsequent amendments.
   - OSHA 29 CFR 1910 -Safety and Health Regulations for General Industry
   - OSHA 29 CFR 1904 - Recording and Reporting Occupational Injuries and Illnesses
C. DOE Orders:
   - DOE Order 0231.1 "Environment, Safety and Health Reporting"
   - DOE Order M231.1 -1 "Environmental Safety and Health Reporting Manual"
   - DOE Order 440.1 "Worker Protection Management"
   - DOE Order 5480.1 "Environmental Safety and Health Programs for DOE Operations"
   - DOE Order 5480.4 "Environmental Protection, Safety, and Health Protection Standards"
D. 10 CFR 835

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E. American National Standards Institute (ANSI) Standards as incorporated by reference in OSHA 29 CFR 1926 and 29 CFR 1910
F. National Fire Protection Association (NFPA) - Codes as incorporated by reference in OSHA 29 CFR 1926 and 29 CFR 1910
G. National Electric Code as incorporated by reference in OSHA 29 CFR 1926 and 29 CFR 1910
H. Kaiser Hill, LLC Health and Safety Practices Manual (Applicable HASPs as identified.)
I. OHM Safety and Health Program
J. OHM, Lower-tier Subcontractors and Vendors will comply with new or modified industry safety and health codes and regulations that apply to this project contract, as they are promulgated during the term of this contract.

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2.0 TASK HEALTH AND SAFETY RESPONSIBILITIES

Health and safety is the responsibility of all personnel working on the site. OHM has a strong commitment to ensuring a safe work environment for all workers on the project. A qualified individual may serve in more than one role. Individual project personnel responsibilities are identified in the following sections and the project organization is summarized in Figure 2-1.

2.1 Project Manager

The OHM Project Manager for the ETP has overall responsibility for work performed by OHM personnel and any subcontractors at the site. The Project Manager, through line management and supervisors, has responsibility for implementing and abiding by the HASP.

2.2 Superintendent

The Superintendent is responsible for overall safety and health during the performance of the construction activity. This person will be present on-site during the performance of construction work and will ensure that provisions of this HASP and the requirements of the Program are fully implemented. The Superintendent manages field operations, executes the Field Implementation Plan (FIP), and is ultimately responsible for the safe and successful completion of the project. The Superintendent also enforces site control, documents task site activities, and conducts daily safety briefings at the start of the work shift. The Superintendent will also interface with the Contractor's Technical Representative (CTR) and HSO to ensure that project goals are being met and that health and safety issues involving the site are addressed.

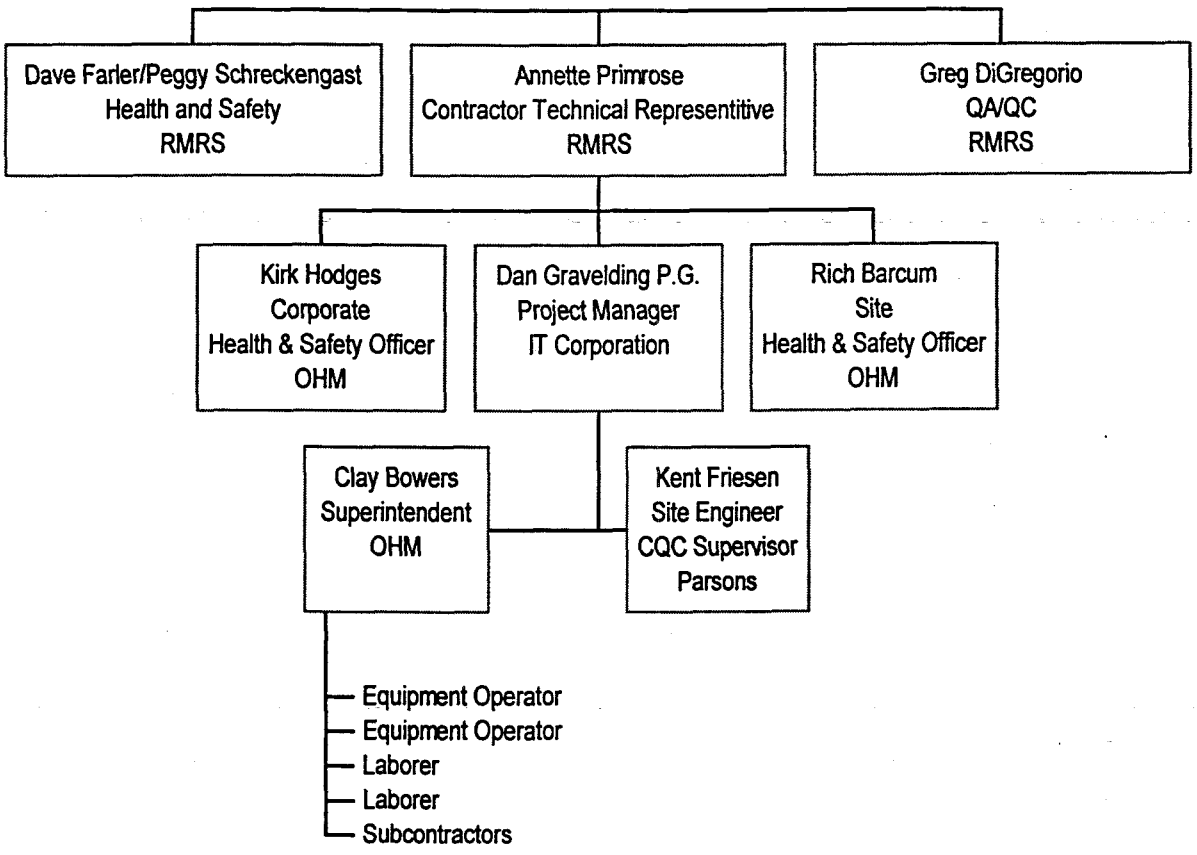
2.3 Health and Safety Officer

OHM will provide a full time HSO, competent through experience and training, to assist the Project Manager in administering the construction project Health and Safety Program. The HSO will have the following minimum qualifications: five years experience as a Safety Professional with emphasis in construction project safety management. This individual will possess one or more of the following Professional Safety and Health Certifications: CSP, ASP, AHST, WSO-CSM, OHST, WSO-CSSD, WSO-CSE, SWO-CST, or CIH, IHIT with documented experience in the construction safety discipline; or demonstratable knowledge of pertinent regulation and guidelines listed in Section 1.4, and meet RFETS qualification program. All site personnel will have the authority to issue a "Cease-Work" directive. Restart authorization will be required from appropriate site personnel prior to beginning work.

The HSO will be present on-site during the performance of construction work. This individual will have no duties other than those functions related to the safety and health performance of the construction project. The responsibilities of HSO will include but not be limited to:

- Implement the HASP, attend pre-work conferences, and conduct all construction site safety and health orientations and/or briefings.
- Document weekly construction safety meetings and daily pre-activity work plan or hazard review meetings.
- Perform or oversee performance of any required monitoring for construction site physical, chemical, or biological hazards.
- Perform daily project safety and health inspections of the construction site, recording hazards found and corrective actions taken in a permanent log. Provide for immediate identification, documentation, abatement and/or resolution of hazards/deficiencies or safety and health rule violations noted during construction activities.
- Ensure the prompt and complete reporting of all construction site accident and incident investigations, and provide appropriate reports to the CTR within the required time frame.

Figure 2-1
East Trench Plume Project
Organization Chart



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- Maintain all required construction activity Health and Safety statistical information and provide monthly to the CTR all information stipulated on the "Monthly Contractor Injury and Illness Statistics" Report, pertinent to employee hours worked, Computerized Accident Incident Reporting System, and OSHA Incidence Rates for construction work performed on-site by the OHM, Lower-tier Subcontractors and Vendors.

2.4 Contractor's Technical Representative

The CTR will be the on-site RMRS representative to provide assistance to the Superintendent and HSO in construction and safety matters and act as liaison for RMRS health and safety professional overseeing the ETP.

2.5 Task Site Personnel

All task site personnel, including RMRS, and OHM personnel, are responsible for understanding and complying with requirements of this HASP. Task site personnel will be briefed by the Superintendent and HSO at the start of each shift. Task site personnel should identify potentially unsafe situations or conditions to the Superintendent, or HSO for corrective action. If unsafe conditions develop, task site personnel are authorized to stop work and notify the Superintendent or HSO of the unsafe condition. Site personnel will meet the qualification established by the RFETS; training will be documented in the readiness assessment, which will be maintained on site.

2.6 Industrial Hygienist/Industrial Hygiene Technician

The Industrial Hygienist/Industrial Hygiene Technician (IH/IHT) is the primary source of information regarding non-radiological hazardous and toxic agents at the task site. The IH/IHT assesses the potential for worker exposures to hazardous agents in accordance with OHM procedures. The IH/IHT recommends appropriate hazard controls for protection of task site personnel, reviews the effectiveness of monitoring and Personal Protective Equipment (PPE) required in this HASP, and recommends changes as appropriate. Following an evacuation, the IH/IHT will assist in determining whether conditions at the task site are safe for reentry. Employees showing health effects resulting from possible exposure to hazardous agents will be referred to the Occupational Medical Program (OMP) by the IH/IHT. The IH/IHT may also have other duties at the task site as specified in other sections of this HASP or OHM procedures and manuals. Because of the possibility non-radiological hazards will be encountered during this investigation, the OHM lead IH will assign an IH/IHT to perform monitoring at the task site as conditions warrant.

2.7 Radiological Control Technician

A Radiological Control Technician (RCT) is not required for this project. In the event radiological contamination is identified, all work will pause and the site re-classified.

This HASP does not address radiological controls. If radiological material is identified through routine screening, then a Radiation Work Plan will be required to be generated identifying radiological controls at this site.

2.8 Non-workers

All persons who may be on the task site that are not a part of the construction team but require access to the project site are considered non-workers for the purposes of this project. A person shall be considered to be on-site when they are present in or beyond the designated work zones (see Section 4). Non-workers will be considered occasional site workers per 29 CFR 1926.65, and must meet minimum training requirements for such workers as described in the OSHA standard and any additional task-specific training specified in Section 3.

Non-workers will be escorted by a fully trained task site representative (i.e., the HSO OR designated alternate) at all times while on-site. All non-workers, including RMRS employees from

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other departments and representatives of DOE, state, or federal regulatory agencies, may not proceed beyond the support zone without receiving a safety briefing, wearing the appropriate protective equipment, and providing proof of meeting the training requirements specified in Section 3 of this HASP.

2.9 Record Keeping Requirements

The following sections discuss the procedures for all applicable record keeping requirements.

2.9.1 Industrial Hygiene and Radiological Monitoring Records

The IHT or HSO will document all personal/area monitoring and associated relevant data. Personal or area monitoring for VOCs will be conducted using NIOSH or OSHA approved integrated sampling techniques. The IHT or HSO will keep detailed records of all industrial hygiene monitoring, daily operational activities, and instrument calibrations.

2.9.2 Logbooks

The HSO and the Superintendent will keep a record of daily task site events in each of their respective controlled logbooks. Sufficient detail will be recorded to ensure project activities can be reconstructed from the notes.

2.9.3 HASP Field Changes

Changing conditions may require this HASP to be revised in the field by the HSO. Editorial or small revisions of scope are approved as field changes and will be performed by "pen and ink" changes but must have prior approval of the RMRS Health and Safety Office. These changes will be hand written by the HSO. The change will be inserted above the word or sentence that requires revision.

The deleted information will be lined through, and the HSO will initial and date the change in the margin of the document. Approval of these changes will be achieved by the HSO contacting the RMRS Health and Safety Office for verbal approval. Within 24 hours of the changes, a formal Document Modification Request will be submitted to the RMRS Health and Safety Office. Conditions requiring the changes to the document, the condition resolution, and personnel contacted for approval of the change will be documented in the HSO logbook. Each field change will be noted on the front sheet to this document so changes can be tracked. Changes to the document will be distributed to the controlled document holders within 48-hours.

Major changes to this document will require the issuance of a new revision. Fieldwork will be allowed to continue, if the change can adequately be performed on a field change document. The revised section will be signed and attached to the controlling document. Approval of the change will be achieved as above.

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3.0 PERSONNEL TRAINING

All RMRS and OHM personnel assigned to the ETP must complete the training required by OSHA as well as site-specific health and safety training courses required by RMRS. The ETPTS is classified as a hazardous waste operation by OSHA standard 29 CFR 1926.65; therefore, the training requirements, including the initial training, annual refresher training, and supervisor training, apply to personnel working at the site. Additional training courses required by RMRS include General Employee Training. Depending on the task for individual employees, specific training may be required, including; annual Hazard Communication training, confined space entry training, fall protection training, and excavation safety.

3.1 Hazardous Waste Site Health and Safety Training

Any RMRS and OHM employee assigned to work on the ETP must complete the 40-hour hazardous waste health and safety course required by OSHA in 29 CFR 1926.65. The 40-hour course and three days of supervised field experience is mandatory for workers who may be required to use respiratory protection equipment and/or who are engaged in activities in which they may be exposed to hazardous substances and health hazards at or above the permissible exposure limits.

All hazardous waste workers must complete an annual 8-hour refresher course. The course content consists of a summary of the 40-hour course. Supervisors of hazardous waste sites or of tasks conducted on hazardous waste sites must complete an additional 8-hour supervisor health and safety training course. A summary of training requirements is given in Table 3-1.

Table 3-1. Required training for task site personnel.

Topic	Superintendent HSO CTR	Task Site Personnel	IH/IHT	Non-workers
Pre-construction site orientation	X	X	X	X
Emergency Response plan*	X	X	X	X
Hazardous waste operator—40 hr[c]	X	X	X	—
Hazardous waste site supervisor	X	—	—	—
Respirator qual. and fit[g]	X X	X X	X X	X

a. Will be included in task site orientation.
b. If entering contaminated areas.
c. Includes 40 hr of classroom instruction and 24-hr field experience.
d. Includes 24 hr of classroom instruction and 8 hr of on-the-job training.
e. As required
f. Radiation Worker-II training is required for entry into a radiologically controlled area (i.e. radiation or contamination zone)
g. If entering areas requiring respirator use.

3.2 Preconstruction Safety and Health Orientation

All personnel reporting for work at the construction site shall attend a documented preconstruction safety and health general orientation conducted by the Superintendent. The orientation shall emphasize that no employee will be required to work in conditions that are unsanitary, hazardous,

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or dangerous to their safety or health, and that accident prevention shall be the responsibility of each individual on the construction site. The employees will be advised of their safety and health rights (a work place free from recognized hazards with a procedure to make hazards known to management) and their safety and health responsibilities (to work in a safe manner). The safety and health orientation shall at a minimum address the additional following points:

- Employee rights and responsibilities, and location of DOE form F5480.4 "Complaint Form"
- OHM, Lower-Tier Subcontractor and/or Vendor responsibilities
- The location of approved Project Health and Safety Plan available for review by employees
- First aid and medical facilities
- Emergency response procedures to include local warning, evacuation, and sheltering
- Specific Occupational Safety and Health programs or procedures applicable to the construction activities
- The Hazards Communications Program
- Employee access to exposure monitoring data and medical records
- General project hazards and the applicable policies and procedures for addressing these hazards
- Construction hazard recognition and the procedures for reporting or correcting unsafe conditions
- Procedures for reporting accidents or incidents
- Fire prevention and control
- Alcohol and drug abuse policy
- Disciplinary procedures for safety infractions or violations

Site specific safety and health requirements may vary from construction project to construction project. Employees with a continued on-site presence or those working on multiple construction projects may be provided with a general construction safety and health orientation of the items referenced prior to the commencement of the initial construction activity, and at least annually thereafter. Orientation on items that vary from project to project shall be provided for each project. The CTR or HSO reserves the right to require and provide additional construction safety and health orientation topics for inclusion in the Health and Safety orientations.

3.3 Daily Pre-Work Meetings

The Superintendent or HSO shall conduct daily pre-work safety briefings (Tailgate Safety Meetings) for construction site employees. The briefings will address the day's planned activities and any pertinent safety and health information the supervisor determines to be applicable and will serve as a daily reminder of safety responsibilities. The length of the pre-work safety briefings will vary depending on the complexity of the day's tasks.

3.4 Weekly Safety Meetings

Documented construction safety and health meetings with mandatory attendance shall be conducted on weekly basis for all construction site employees. The Superintendent or the HSO will conduct each meeting. Discussion at weekly meetings may include the following topics:

- Health and safety considerations and the required PPE for current operations
- Any revisions to the plan
- Any new MSDS
- Documented or observed unsafe acts committed at the work site
- Clarification of the safety requirements violated
- Methods to prevent future violations
- Approved changes to the HASP.

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Workers are required to attend the weekly safety meetings and sign a roster (attendance sheet) that will be maintained by the HSO at the work location. Meeting minutes will be documented and attached to the roster. The Superintendent or HSO will review the meeting minutes with absentees and have them sign the attendance sheet. This documentation will be filed at the work site, available to RMRS upon request, and archived when the project is completed. Safety meetings will be conducted weekly at a minimum or more frequently as necessary. The CTR shall be notified 24 hours prior to the meeting. A formal outline of the meeting shall be maintained at the work location and copies of the outline shall be furnished to the CTR within 24 hours of the meeting. The CTR reserves the right to provide additional safety meeting topics and material for inclusion in Subcontractor safety meetings.

3.5 Emergency Response Plan

Construction site personnel will be briefed during initial orientation on the Emergency Response Plan and participate in any rehearsals conducted by RMRS Emergency Preparedness.

3.6 Verification of Training

Orientation and training records sufficient to verify the completion of applicable training required by DOE Orders, OSHA Standards, and/or Site contractual requirements shall be maintained and available at the construction site.

3.7 Respiratory Program

A comprehensive respiratory protection program has been established by and is required in all locations where use of such equipment is intended to lesson the potential for adverse health affects to any employee. As part of the respiratory training program, each employee is instructed in the following elements:

- Nature of the respiratory hazard on the work site and the appraisal of potential consequences it the respiratory protection is not used
- Use and proper fitting of the respirator
- Cleaning, disinfecting, inspection, maintenance, and storage of the respirator
- Proper selection, capabilities, and limitations.

Routinely used respiratory equipment will be inspected, cleaned, and disinfected daily to help assure proper hygienic practices. An inspection of these respirators will include the following:

- Examination of the head straps for breaks, loss of elasticity, broken or malfunctioning buckles and other attachments.
- Examination of the face piece for excessive dirt, cracks, tears, distortion, holes, or inflexibility.
- Examination of the exhalation and inhalation valves for any foreign material, cracks, tears, or distortion in the valve. Additional checks will be made to inspect the proper insertion, defective valve covers, or improper installation.
- Examination of the air purifying elements for incorrect cartridge, expired shelf life of the cartridge, or damaged cartridge or cartridge-holder.
- Examination for proper insertion of the cartridge into the face-piece and a check of the gaskets inside the cartridge-holder.

If level C protection is required, respirator cartridges will be changed daily or if increased breathing resistance is detected. All respirators will be inspected prior to each day's use. If broken or malfunctioning parts are found during the cleaning process, these parts will be replaced or new respiratory equipment will be issued to the user. The respiratory protective equipment will be stored in a readily accessible area protected from any mechanical, chemical, heat, dust, or excessive moisture damage.

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All employees or other persons requiring entry into an EZ that requires respiratory protection must abide by the following respiratory program.

- Only personnel who have been trained to wear and maintain respirators properly will be allowed to use respiratory protection.
- Respirator users will be instructed in the proper use and limitations of respirators.
- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection, will be made by the projects HSO or designee.
- Positive and negative pressure checks will be performed each time the respirator is donned.
- Only employees who have been fit tested within the last 12 months will be allowed to work in atmospheres where respirators are required.
- If an employee has difficulty in breathing during fit test or during use, he/she will be evaluated medically to determine if he/she can wear a respirator safely while performing assigned tasks.
- No employee will be assigned to tasks requiring the use of respirators if, based upon the most recent medical examination a physician determines that the health or safety of the employee will be impaired by respirator use.
- Contact lenses will not be worn while using any type of respiratory protection.
- Air-supplied respirators will be assembled according to manufacturer's specifications. Hose length, couplings, valves, regulators, manifolds, and all accessories will meet ANSI and the manufacturer's requirements.
- Respirators will be cleaned and sanitized after each use.
- Respirators will be stored in a convenient, clean, and sanitary location onsite.
- Respirators will be inspected during cleaning, and worn or deteriorated parts will be replaced.
- Facial hair that might interfere with good face-piece seal or proper operation of the respirator is prohibited.
- The HSO will review the respiratory protection program daily to ensure employees are properly wearing and maintaining their respirators and that the respiratory protection is adequately protecting the employees.
- The HSO and the Project Manager will evaluate the respiratory protection program monthly to ensure the continuing effectiveness.
- Respirators used for emergency response will be inspected weekly by the HSO.

4.0 SITE CONTROL AND SECURITY

The purpose of this site control plan is to protect workers, the public, and the environment from the potential hazards associated with the construction of the East Trench Plume barrier and treatment system.

4.1 Site Control Designation

The project work area has not been designated a Radiological Control Area (RCA). The roped off work area itself will be designated as an Exclusion Zone (EZ), and the staging area outside a work location designated as the Contamination Reduction Zone (CRZ). Access to these areas will be controlled. Personnel working in the areas must meet specific training requirements, be participants in a Medical Surveillance Program (MSP) and wear required PPE. Minimum requirements for access to these designated areas are summarized below. Detailed PPE, training, and decontamination requirements are presented in the respective sections of this plan.

4.2 Exclusion Zone

The limits of the EZ will be established and marked by yellow construction rope and posted as a construction zone. The EZ will be the area in the immediate vicinity of where the barrier collection system is being installed and where the treatment system will be constructed. The EZ for the collection system could move as the barrier is being constructed. Personnel entering these areas will be required to wear appropriate PPE as described in Section 5.

4.3 Contamination Reduction Zone

Adjacent to the EZ is the CRZ where appropriate measures will be in effect to reduce the potential for spreading contamination via the workers and equipment. The area adjacent to the EZ will be designated as a CRZ. All personnel conducting or supervising activities in this area are required to have appropriate training as required in Section 3 and wear appropriate PPE (Section 5).

4.4 Support Zone

The Support Zone will be outside the CRZ and will be the area where support workers will provide assistance to workers inside the EZ and CRZ. This area will be posted as a construction zone. Only clean or appropriately containerized equipment or material will be allowed to exit into the support zone from the CRZ. Visitors and observers will comply with the site control designations and the zone requirements established at the work site. Visitors will not be allowed to enter the EZ and/or CRZ without training as required in Section 3 of this HASP.

4.4.1 Designated Eating Area

Ingestion of hazardous substances is possible when workers do not practice good personal hygiene habits. It is important to wash hands, face, and other exposed skin thoroughly after completing work and before smoking, eating, drinking, and chewing gum or tobacco. No smoking, chewing, eating, or drinking is allowed in the buffer zone. The designated eating area will be in the break trailer.

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5.0 PERSONAL PROTECTIVE EQUIPMENT

Personal protective equipment shall be used whenever its use can prevent injury. The appropriate PPE for the work being performed will be identified in the activity hazard analysis (AHA). In addition to specifying and providing employee PPE requirements, the Superintendent is responsible for ensuring that each employee is properly trained in the use and maintenance of all PPE utilized. Where OSHA Standards and Regulations specify PPE requirements, the requirements shall be strictly adhered to. The CTR or HSO may stipulate, in writing, modifications to ETP PPE requirements with approval of the OHM IH. The Superintendent will control access to and egress from the construction area and shall ensure that all employees and visitors entering the construction area are wearing the appropriate PPE.

5.1 Components of Level of Protection

OSHA and the EPA define four levels of protective equipment ensembles in the 29 CFR 1926.65 regulations, Levels A, B, C, and D. Levels A and B specifying the use of self-contained breathing apparatus are not discussed in this plan. If either of these levels of protection are required due to the presence of extreme site hazards, this situation will be addressed in a separate amendment to this plan.

The levels of protection that are defined for this project include Level C, Level D, and a modified Level D. The specific equipment that is identified for each of these general ensembles is listed in Table 5-1.

5.2 PPE Requirements for Construction Support Zone

All personnel assigned work within a posted construction area outside the EZ will wear level D PPE. Certain situations may require some of the following additions to Level D status. All personnel will wear ANSI Z89.1 approved hard hats. Except for surveyors while "sighting", hard hats shall be properly worn with the bill (peak) forward over the eyes.

All personnel assigned work within a posted construction area will wear ANSI Z87.1 approved industrial strength eye protection with permanently fixed side shields. Tinted lenses are not allowed to be worn during the hours of darkness or within buildings, enclosures, or structures. Additional ANSI approved PPE for the protection of the eyes and face shall be provided and used when specified.

All personnel assigned work within the posted construction area will wear approved appropriate hearing protection for the construction activities being performed.

All construction "Fall Protection" PPE will, at a minimum, consist of an approved full body harness with a shock absorbing lanyard which when used will be attached to an approved anchorage point.

All personnel assigned work within a posted construction area and outside of an office environment will wear shirts that cover the shoulders with a minimum of four inches of sleeve, long pants, and approved leather above the ankle work shoes/boots. Work shoes/boots with ANSI Z41.1 approved "safety toe caps" will be provided as required by the work activity. Additionally, all concrete demolition or earth compacting performed with mechanical equipment will be conducted while wearing approved foot and metatarsal protection devices.

All personnel working on or near roadways, or within posted construction areas where vehicle or heavy equipment traffic is continuous, will wear reflective vests.

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Table 5-1. Specific Requirements for Each Level of Protection.

Level Of Protection	Equipment	Protection Provided	Should Be Used When	Limiting Criteria
D	REQUIRED: • Steel-toed boots or shoes • Long legged pants • Safety glasses or chemical splash goggles with side shield OPTIONAL, AS REQUIRED • Work Gloves • Coveralls • Hearing Protection • Hard Hats	No respiratory protection. Minimal skin protection.	• The atmosphere contains no known hazard • Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.	• May be worn in support of the CRZ • This level should not be worn in the EZ • The atmosphere must contain at least 19.5 percent oxygen
Modified D	REQUIRED: All requirements of Level D plus: • Chemically protective suit, either tyvek or polyethylene coated tyvek or DOE provided coveralls • Inner and outer gloves • Chemical-resistant safety boots/shoes or steel toed work boots with latex overshoes (taped to suit) OPTIONAL, AS REQUIRED • Splash shield • Hearing Protection	Increased skin and splash protection, but no respiratory protection	Working in dusty areas or in areas with splash potential where low inhalation hazard is present	• May be worn in EZ if the area has been demonstrated to be free of air contaminants above the action levels • The atmosphere must contain at least 19.5 percent oxygen

C	REQUIRED:
	• Full facepiece, air-purifying respirator equipped with HEPA filter cartridges
	• Chemically protective clothing dependent on the specific area working:
	  • Tyvek full body suit for dry areas, or,
	  • Polyethylene coated Tyvek for situation in which splash hazards exist
	• Inner latex gloves and outer nitrile gloves (taped to suit)
	• Chemical-resistant safety boots/shoes or steel toed work boots with latex overshoes (taped to suit)
	• Hard hat
	• Two-way radio communications
	OPTIONAL, AS REQUIRED
	• Coveralls under chemically protective suit
	• Face shield for splash protection
		Respiratory protection up to 50 times the permissible exposure level of selected contaminants (particulates, and some organic compounds), and skin and splash protection from contaminated dust and water	• The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect any exposed skin
			• The types of air contaminants have been identified , concentrations measured, and a canister is available that can remove the contaminant
			• All criteria for the use of air-purifying respirators are met
				• Atmospheric concentration of chemicals must not exceed immediately dangerous to life and health levels
				• The atmosphere must contain at least 19.5 percent oxygen

5.3 PPE Requirements for Exclusion Zone

Personnel entering the EZ during installation of the collection barrier or construction of the treatment system requires a minimum of Modified Level D PPE. PPE requirements could change as site conditions change. The EZ will be monitored by the HSO and if conditions warrant (e.g., unexpected or higher than expected levels of contamination, or respiratory protection is required) Level C PPE may be required during collection system or treatment system installation. Decisions on changing PPE will be made by the Superintendent or Project Manager, only with concurrence from the HSO, RMRS Radiological Engineer and RMRS Industrial Hygiene.

5.3.1 Donning and Doffing Guidelines

The following guidelines are required when Level C PPE or higher is required for a task. No persons shall be allowed to enter the EZ if they are not wearing the required PPE.

Donning Guidelines:

- Remove bulky outerwear. Store personal clothes in a clean location.
- Put on work clothes or coveralls.
- Put on the required protective body garment.
- Tape the legs of the coveralls to boots with duct tape.
- Put on inner chemical-resistant gloves.
- Put on outer chemical-resistant gloves.
- Put on respirator with cartridges.
- Perform positive and negative pressure fit-check.
- Put on hood of protective body garment, if required.
- Tape up hood and gloves, if required.
- Put on hard hat.

Doffing Guidelines:

- Enter CRZ.
- Remove tape, if applicable.
- Remove outer boots, if applicable.
- Remove outer protective body garment (if applicable) and gloves.
- Place PPE in drums or plastic bags.
- Remove respirator with inner gloves.
- Discard cartridges if at end of work shift.
- Remove inner gloves.
- Wash hands and face.
- Proceed through showers, if applicable.
- Proceed to clean area and dress.
- Clean and sanitize respirator.

6.0 OCCUPATIONAL MEDICAL PROGRAM AND MEDICAL SURVEILLANCE

Personnel will participate in an MSP as indicated by DOE Order 5480.10, *Contractor Industrial Hygiene Program* and 29 CFR 1926.65, which requires medical surveillance examinations if a potential overexposure to chemical or physical stresses exists. All employees who are or may be exposed to hazardous substances at or above published exposure limits are included. Also included are workers who have been exposed to radiation fields or have received exposure to radionuclides by inhalation or ingestion. Not all subcontractor personnel will meet the criteria for inclusion in the MSP. The criteria for inclusion in an MSP is a work history indicating greater than 30 days of potential exposure to hazardous constituents including radionuclides or personnel who have worn a respirator for more than 30 days. Hazard-specific medical surveillance, such as audiometric examinations for noise exposure, may also be required. In addition, anyone obtaining respirator fit testing and training is required to obtain medical approval certifying their ability to wear a respirator per 29 CFR 1910.134. All subcontractors are required to provide medical surveillance for employees working in the ETP and to provide acknowledgment of such surveillance per 29 CFR 1926.65. Radiological internal dosimetry is required for individuals meeting the requirements under the ROI.

6.1 Injuries at the Task Site

The policy of the RMRS OMP is to examine all workers, including subcontractors, if the workers are experiencing symptoms consistent with exposure to a hazardous material, or there is reason to believe they have been exposed to toxic substances or physical agents in excess of allowable limits.

In the event of a known or suspected injury or illness caused by exposure to a hazardous substance or physical agent, the Superintendent, and HSO will be notified, and the worker(s) will be transported to the RMRS medical facility for evaluation, accompanied by the IHT or HSO. As much as is available of the following information will accompany the individual to the medical facility:

- Name, job title, work location, and supervisor's name and phone number
- Substances or physical agents (known or suspected), with MSDS if available
- Date of employee's first exposure to the substance or physical agent
- Locations, dates, and results of exposure monitoring
- PPE in use during this task (for example, respirator and cartridge)
- Number of days per month PPE has been in use
- Anticipated future exposure to the substance or agent.

Further medical evaluation will be in accordance with the symptoms, hazard involved, exposure level, and specific medical surveillance requirements.

All injuries, no matter how minor, will require the person to report to Occupational Medicine for evaluation. For injuries, OSHA reportable injuries (Form 101), and a DOE 5484.3 form (Individual Accident/Incident Report), will be completed and distributed to the OSHA 200 Log for the project. All recordable accidents, injuries, or incidents must be reported immediately to the Superintendent, HSO and the CTR.

7.0 PRELIMINARY HAZARD ASSESSMENT (AHA/JHA ASSIGNMENTS)

Personnel may be exposed to chemical and physical agents or radiological hazards while working at the ETP site. Chemical and radiological hazards will most likely be present at this site. Intrusive activities involved in installing a groundwater collection and groundwater treatment system may cause workers to come into contact with VOCs, metals, and radioactive contaminants present in the groundwater or the surrounding soil. Physical hazards inherent with working around large equipment are present at the site. Radiological hazards and chemical hazards are outlined in Section 7.1. The industrial hygiene and radiological monitoring plans are outlined in 7.2. Section 7.3 presents the physical hazards associated with construction activities under the scope of this HASP.

Based on the FIP prepared from the construction work package, an AHA will be completed for each task. Hazards associated with chemical and radioactive contamination are not expected to be the principal concern. The selection of PPE and safe work procedures to be followed during the majority of construction activities are subsequently driven by those requirements covering construction health and safety hazards. If contamination, either radioactive or chemical, is detected by the HSO or IHT for any work activity, the work activity will be stopped in a safe condition, personnel will exit the work area to a safe gathering area (in the support zone), and necessary personal surveys will be performed to determine the extent of contamination. Contaminated soil will be contained. Once contained, a determination will be made as to how to proceed and whether or not PPE will require upgrading. The HSO and Superintendent will determine if an upgrade to PPE is required for specific activities or contamination indicated from monitoring. Any change in PPE or work scope will require personnel briefings, and "common sense" checks to ensure the work activity has safely been revised to allow for efficient and safe completion. The following AHA's will be pertinent to site activity. Detailed construction techniques are discussed in the Field Implementation Plan (FIP).

7.1 Radiological and Chemical Hazards

The potential for encountering contaminated soil or groundwater that represents a risk for worker exposure is minimal, however the work area will be monitored for chemicals, specifically VOCs per Section 7.2. Chemical exposure at or above threshold limit values (TLV) is not anticipated. An action limit for the principal VOCs, CCl_4, PCE, trichloroethene (TCE) and methylene chloride has been established as any reading above background to ensure that an immediate indication of working in a potentially contaminated area occurs to allow workers and management to back away and reassess the working environment. Likewise, soil radiological contamination is not expected, and the action values established as indicating a contaminated area during radiation surveys also allow for workers to back away until the nature and extent of the contamination is determined and protective work regimes are identified.

If contamination, either radioactive or chemical, is detected above action levels by the HSO/IHT for any work activity, the work activity will be stopped in a safe condition, personnel will exit the work area to a safe gathering area at the direction of the HSO, and necessary personal surveys will be performed to determine the extent of contamination. Contamination deemed easily mobilized will be contained to reduce the risk of spreading the contamination. Existing controls will be evaluated and modified as necessary before work resumes.

Activity	Hazard	Preventive/Control Measures
All Site Activities	General Work Hazards	All personnel will wear Level D as specified in Table 5-1 including sturdy work clothing, work gloves, steel-toed safety shoes, safety glasses with side shields, hard hats, and reflective vests. All safety equipment must meet applicable ANSI Standards.
	Heat Stress: • Sunburn • Heat rash • Heat cramps • Heat exhaustion • Heat stroke Cold Stress: • Frost Bite • Hypothermia	Heat stress monitoring will be conducted (if appropriate) in regards to work load and PPE worn. • Use hats, long-sleeved clothing, and/or sunscreen. • Keep skin clean and dry; encourage regular bathing. • Drink sufficient replacement fluids. • Work-rest regimens and administrative controls will be adhered to. • Dress appropriately for conditions; limit exposure time in extremely cold conditions. • Remove wet clothing, ASAP • Cover areas of exposed skin
	Adverse Weather: • Rain/snow • Wind, tornados • Lightning	• Observe changing weather conditions. • Wear appropriate wet-weather gear as required • Stop work and seek shelter as required • Use "flash-to-bang" time of five seconds for one mile as a means of estimating the distance of lightning.
	Slips, Trips, and Falls	• Utilize good housekeeping. • Keep pathways and work areas free of obstructions. • Wear required Level D PPE. • Clearly mark hazards which may not be removed.
	Traffic (including site entry/exit)	• Place barricades or fencing around work areas. • Use warning signs and/or flag person(s) • Vehicle operators must obey all state, local, and site traffic rules and laws. • All vehicle occupants will wear seat belts.
	Materials Handling	• Use cotton/leather work gloves with other Level D PPE. • Use mechanical equipment or material handling tools (drum dolly) when possible. • Lift with legs, not the back. • Use buddy system. • Keep hands and feet clear of moving materials and equipment.
	Noise	• Conduct noise surveys as required or when normal conversation between two individuals approximately three feet apart is impaired. • Noise contours will be established around noise hazardous operations (i.e., within 15 feet of Geoprobe or other heavy equipment) when in operation. • Require use of hearing protection when noise levels exceed 85 dB(A); hearing plugs and muffs required when noise levels exceed 115 dB(A).
	Communications	• Establish emergency evacuation signals. • Establish hand signals for use when verbal communications are impaired.
	Lighting	• Maintain minimum of 5 footcandles in work areas during site activities.

Activity	Hazard	Preventive/Control Measures
Use of Energized Electrical Equipment	Electrical Shock	• All equipment will be plugged into GFCI protected outlets. • Temporary wiring will not be allowed; qualified electrician will install permanent wiring. • Equipment and extension cords will be UL listed and properly sized for the specific application; frayed or damaged equipment or cords will be removed from service. • Lockout/tagout procedures shall be used before any repair or maintenance on electrical equipment.
	Fire	• A minimum of one 10 pound, ABC fire extinguisher will be on site.
Use of Generators	Electrical Shock	• Cords will be plugged into a GFCI protected outlet. • The generator will be properly grounded. • The generator will be inspected at least daily and the GFCI tested prior to each shift.
	Fire and Burns	• A minimum of one 10 pound, ABC fire extinguisher will be on site next to the generator • All refueling will be conducted at the beginning of shift, or after the generator has been allowed to cool for at least 5 minutes.
	Noise	• Use hearing protection when within 15 feet of operating generator.
Use of On-Site Products (including gasoline and other fuels)	Chemical Exposures	• Read product material safety data sheets (MSDS) and observe handling precautions and recommendations including gloves for handling petroleum products.
Use of PPE	Physical Fatigue	Adjust workload to level of PPE.
	Impaired Breathing (when using respirator) Increased Heat Stress	• Require use of Hot Work Permit and fire Watch • A minimum of one 10 pound, ABC fire extinguisher will be on site next to the hot work site. • Use of appropriate Level D PPE including addition of welding/cutting goggles, face shields, and welding gloves/aprons.

Activity	Hazard	Preventive/Control Measures
Heavy Equipment and Machinery (includes tank removal and excavations)	• Personal Injury • Property Damage • Equipment Damage	• Use appropriate PPE as specified in Table 5-1, including the use of respirators (level C) if indicated by on-site monitoring. • Only authorized personnel shall operate heavy equipment. • Moving heavy equipment must have properly functioning back-up alarms. • Spotters will assist operators in tight or confined spaces and steep grades • Operators shall maintain a constant awareness of personnel and equipment in the work areas. • Excavators, drill rigs, booms or similar equipment shall have a minimum 20 feet clearance from overhead electrical power lines. • Loads shall never be carried over personnel. • Equipment and machinery will be inspected prior to each work shift. Any unsafe equipment shall immediately be taken out of service and its use prohibited until unsafe conditions have been corrected. • Mechanized equipment shall be shut down prior to and during fueling operations. • Whenever equipment is parked, the parking brake shall be set and wheels blocked. • Heavy equipment shall be equipped with a fire extinguisher. • Site workers shall establish hand signals when verbal communication becomes difficult. • Use hearing protection when noise levels exceed 85 dB in the work area.
Excavating Contaminated Soils	Chemical Exposures	• Monitor for airborne contaminants with direct reading instruments. • Use of PPE (Level D and/or C) as required by on-site monitoring and as specified in Table 5-1. • Avoid all skin contact with potentially contaminated soils. • Utilize respirators as required.
	Sloughing or Cave-In of Excavation Walls	• Use of proper excavation safety and construction techniques including sloping, stepping, shoring, and proper placement of spoils. • Daily inspection by OSHA excavation safety competent person.
	Equipment Falling Into Excavation	• All equipment, except the excavator, will be kept at least two feet away from the edge of the trench.
	Underground Utilities	• Underground utilities checklist and inspection will be completed prior to any excavation.

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Activity	Hazard	Preventive/Control Measures
Placement of Iron Media and Backfilling Excavations	Airborne Chemical and Dust Exposures	• On-site monitoring for potential chemical and dust exposures including the iron media. • Use of PPE (Level D or C), including respirators, as specified in Table 5-1.
Water Spraying for Dust Control	Mechanical Equipment and Pressurized Hoses	• Inspect equipment prior to each use. • Repair/replace any damaged equipment or hose. • Fill and operate tankers in accordance with safety guidelines. • Observe proper safety procedures when using pressure hoses and applying water stream. • Use appropriate PPE including rain gear or other water-repellent clothing if needed to protect against splashing.
Bloodborne Pathogens (designated Firstaid/CRP providers)	Pathogen Exposure From Contact With Body Fluids	• Use universal precautions including additional protective PPE (Gloves and CPR face shield) and hand washing. • Notify supervisor immediately of any potential exposure. • Obtain employer-provided immunizations.
Heat Welding HDPE Piping	Fire and Burns Slips Trips and Falls	• A minimum of one 10 pound, ABC fire extinguisher will be on site during heat welding activities • Leather gloves and Eye protection must be worn at all times Utilize good housekeeping. • Keep pathways and work areas free of obstructions. • Wear required Level D PPE. • Clearly mark hazards which may not be removed.

Table 7-1. Task Site Activities And Associated Hazards.

Activity or task	Associated hazards or hazardous agents
Task 1	
Intrusive work - installing groundwater barrier	Radioactive contaminants (see Section 7.1) Metals, VOCs, inorganic compounds (see Section 7.2.1) Temperature extremes (see Section 7.3.1) Noise (see Section 7.3.3) Fire (see Section 7.3.4) Construction health and safety hazards (see Section 7.3.7) Hantavirus from mice (see Section 7.3.5) Snake & insect bites (see Section 7.3.5) Nuisance dust
Task 2	
Construction of groundwater treatment unit	Radioactive contaminants(see Section 7.1) Metals, VOCs, inorganic compounds (see Section 7.2.1) Temperature extremes(see Section 7.3.1) Noise (see Section 7.3.3) Fire (see Section 7.3.4) Construction health and safety hazards (see Section 7.3.7) Hantavirus from mice (see Section 7.3.5) Snake & insect bites (see Section 7.3.5) Nuisance dust

The project HSO will be present during the site activities to monitor work areas and personnel. Radioactivity will be monitored using direct reading alpha, beta, and gamma instruments. Air monitoring for airborne radioactive particles may be performed and may include personnel and area monitoring. VOC monitoring will be performed using a photo ionization detector (PID) using a 11.7 eV lamp, and hearing protection requirements will be evaluated using a sound level meter and noise dosimeters (if required). Standard operating procedures (SOPs) will be followed for the calibration and operation of equipment used.

7.2 Area and Personnel Monitoring

Exposures to chemicals, radiological contaminants/fields, and physical agents will be anticipated via the completion of a hazard analysis performed for a specific work plan. To verify that contaminated soil/waste has not been encountered, the HSP will perform area monitoring by taking readings of soil at ground level and equipment surfaces. Personal monitoring will be performed particularly for specific high-risk operations where the potential for encountering contamination is high or contamination has been detected. Construction health and safety hazards will be monitored and controlled as outlined in Section 7.3.7. Workers must be notified of occupational monitoring results.

If contaminated soil is encountered (either chemical or radioactive), a buffer zone will be enforced to minimize the spread of contamination. All personnel will receive whole-body personal surveys before leaving the contamination buffer area to ensure radioactive soil particles have not adhered to clothing, skin, or hair. PPE requirements may be upgraded to provide skin and respiratory protection depending on the monitoring data.

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7.2.1 Area Monitoring

Unearthing any potential buried waste containers such as pieces of drums, yellow bags, or boxes will because to immediately pause work. PPE requirements may be upgraded, the materials will be screened with field instruments, and a sample of surrounding soil will be analyzed for alpha and gamma-emitting radionuclides using alpha and gamma spectroscopy.

Although most of the contaminated soil has been removed from the East Trench Plume Site, the potential for encountering soil contaminated with organic and inorganic compounds is still possible during the installation of the collection and treatment systems. The HSO will monitor for volatile compounds using a PID (HNu or equivalent). The monitoring will be used strictly for the detection of VOCs above background levels. Detection of VOCs at concentrations greater than background levels at ground level for a sustained two minutes will require personnel to exit the area. Upon detection, the Project Manager will be notified to coordinate the development of corrective actions. The HSO may also determine that personnel need to be monitored with a detector in their breathing zone or by wearing personal sampling pumps with appropriate media. The organic vapor dosimeters will provide a personal exposure record. Because monitoring for inorganic compounds cannot be achieved through the use of a PID, personnel will be instructed to notify the HSO if soil discolorations or metal objects are discovered. Such inorganics are expected to be found in conjunction with the organic and radioactive contamination that will be monitored. Discolored soil will be assumed to be indicative of contaminated soil until monitoring/sampling proves otherwise.

The HSO is responsible for monitoring for other hazards such as noise and temperature extremes. Table 7-2 lists the contaminants that may be present within the ETP site, the toxicity values, and signs of over-exposure. Contaminants to be monitored are described in Table 7-3, and monitoring equipment is identified in Table 7-4.

7.2.2 Action Levels

All site activities are designed to be performed and controlled to prevent personnel and equipment from becoming contaminated. If contamination, either radioactive or chemical, is detected by the HSO for any work activity, the work activity will be stopped in a safe condition, personnel will exit the work area to a safe gathering area, and necessary personal surveys will be performed to determine the extent of contamination. Contamination deemed easily mobilized, as identified by the RMRS RCT, will be contained to reduce the risk of spreading the contamination. All corrective actions and decontamination efforts will be controlled through the HSO and site specific procedures. Action levels are identified in Table 7-5 of this HASP.

Table 7-2. Hazardous Materials Present at ETP.

Hazardous Material Name (CAS Number)	Exposure Limit[a]	Potential Routes of Exposure[b]	Symptoms of Overexposure	Carcinogen
Carbon Tetrachloride (CCl_4) (56-23-5)	5 ppm (ACGIH)	S, Ih	Dizziness, fatigue, headache, nervousness, stupor, nausea, vomiting, diarrhea.	Suspected
Trichloroethene (TCE) (79-01-6)	50 ppm (ACGIH)	S, Ih	Drowsiness, nausea, vomiting, ulceration.	No
Methylene Chloride (75-09-2)	25 PEL OSHA	S	Excessive fatigue, headache, nervousness, weakness, nausea.	Suspected
Tetrachloroethylene (PCE) (127-18-4)	25 ppm (ACGIH)	Ih	Vertigo, dizziness, nausea.	No
Vinyl Chloride (75-01-4)	1 ppm (OSHA)	Ih	Dizziness, lightheadedness, nausea, and vision	Yes
Antimony (7440-36-0)	0.5 mg/m^3 (ACGIH)	Ih	Irritation of skin, eyes, and mucous membranes.	No
Manganese (7439-96-5)	0.2 mg/m^3 (ACGIH)	Ih	Influenza-like illness.	No
Thallium (7440-28-0)	0.1 mg/mg^3 (ACGIH)	Ih, S	Repeated vomiting, headache, weakness, abdominal pain, tremors, convulsions, diarrhea	No
Radionuclides[1]	Per *RMRS Radiological Control Manual* limits	Ih, S	Fatigue, nausea, vomiting, reddening of the skin.	Yes
Gasoline (8006-61-9)	300 ppm (ACGIH)	Ih, S	Irritation of the skin. Headache dizziness and confusion.	No
Nuisance Dust	3 mg/m^3(res) (ACGIH)	Ih	Irritation of skin, eyes, and mucous membranes.	

[1]The radionuclides include isotopes of Pu, U, Am, and Cs.
a. Most current/recent values; TWA = time-weighted average; ACGIH = American Conference of Governmental Industrial Hygienists
b. Ih = inhalation, S = skin

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Table 7-3. Contaminants to be Monitored During Construction.

Task or Assignment	Contaminant or Agent to be Monitored[a]
Site construction activities	Radioactive contaminants Volatile organics Noise Temperature extremes Nuisance dust

a. Monitoring at the discretion of the IHT/RCT/EHS Field Supervisor

Table 7-4. Equipment to be Used for Industrial Hygiene and Radiological Monitoring.

Equipment	Hazard to be Monitored
PID (11.7 eV), HNu, or equivalent Mini Ram or equivalent dust meter	Volatile organics
Sound level meter and/or noise dosimeter	Noise levels
Gas Chromatograph or Colorimetric tubes	Organic contaminant identification
LEL,O2, CO meter	Confined Space monitoring
Thermometer	Temperature extremes
N E Electra with appropriate probe	Alpha/Beta/Gamma emitting radio nuclides
Bicron micro R (or equivalent)	Personnel radiation exposure
Personnel sample pumps/area air monitoring w/filter	Personnel/Area radiation/chemical exposure from air contaminants
Personnel sample pumps/area air monitoring w/filter	Personnel/Area radiation/chemical exposure from air contaminants

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Table 7-5. Action Levels For the Task Site.

Agent Name and Monitoring Method	Action Level	Action Taken
Noise	85 dba	Don hearing protection. Begin personal monitoring.
Volatile organics (PID)	above background in the breathing zone, sustained for 2 min.	Exit the area to safe area per RCT/IHT. Await direction
air particulates (air monitor)	1.5 mg/m^3, sustained	Exit to safe area. Water spray for dust control.

7.3 Physical Hazards Evaluation, Control, and Monitoring

The physical hazards present at the task site and the methods used to monitor and control them are described in the following paragraphs.

7.3.1 Temperature Extremes

The ETP groundwater collection and treatment system is scheduled to begin in June 1998. Work activities will be performed outdoors and the major concern will probably be heat stress. Sunburn/UV exposure will also be a hazard associated with this project. Preventative measures for sunburn/UV exposure include hats, long sleeve shirts, and skin care projects with SPF above 15.

7.3.1.1 Heat Stress

High body temperatures can result in heat fatigue, physical discomfort, and death. Personnel must inform their supervisor or HSO if they experience any of the signs and symptoms of heat stress or observe their co-worker experiencing these symptoms.

Workers may be periodically interviewed by the HSO to ensure excessive heat exposure is not occurring. Workers will be encouraged to monitor their body signs and take a break if symptoms of heat stress occur. The signs of heat stress are:

- Clammy skin
- Dizziness or nausea
- Profuse sweating
- Vision problems.
- Fatigue
- Skin color change

Individuals showing any of the symptoms listed above will stop work, move to a shaded area to rest, be provided cool drinking water, and be monitored by a Medic First Aid qualified person. If personnel exhibiting symptoms of heat stress do not show signs of immediate recovery when removed to the rest area, they will be transported to the dispensary for medical attention.

Heat stroke is an extremely serious condition that can result in death and should be treated as such. An individual who stops sweating, or who shows symptoms of confusion, slurred speech, or any other evidence of change in level of consciousness, will be soaked with water and transported immediately to the nearest medical facility for evaluation.

7.3.1.1 Cold Stress

Cold stress is possible from overexposure during winter weather. Most cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a drop in the deep-core body temperature. Refer to Health and Safety Procedure 300—Cold Stress.

Signs and Symptoms. Employees should be protected from exposure to cold so that their deep-core body temperature does not fall below 99.6 degrees Fahrenheit (°F). A lower body temperature will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences.

Frostbite. Frostbite occurs when the extremities do not get sufficient heat from the central body stores. The fluids around the cells of the body tissues freeze from exposure to low temperatures. This condition can result in damage to, and loss of, tissue. The most vulnerable areas are the nose, cheeks, ears, fingers, and toes.

Damage from frostbite can occur in either the outer layers of skin, or in the tissue beneath these layers and can be serious, resulting in scarring, tissue death, permanent loss of movement, or amputation. There are three degrees of frostbite:

- First Degree - Freezing without blistering or peeling
- Second Degree - Freezing with blistering or peeling
- Third Degree - Freezing with skin tissue death and possible deeper tissue damage.

Symptoms of frostbite include:

- Skin color changes to white or grayish-yellow, to reddish-violet, and finally black as the tissue dies
- Pain may be felt at first, but subsides
- Coldness or numbness of the affected part.

Hypothermia. This is the most severe form of cold stress and results from a drop in the bodies core temperature. The symptoms of hypothermia are:

- First, uncontrollable shivering and the sensation of cold
- Heartbeat slows and may become irregular
- Pulse weakens and the blood pressure changes
- As the bodies core temperature drops, other signs may include cool skin, slow irregular breathing, and apparent exhaustion
- When core temperatures are in the mid-range, the victim may become listless, confused, exhibit severe shivering, or develop severe pain in the extremities
- Final signs are a significant drop in blood pressure, fatigue, and shallow respiration.

Control Measures. When the ambient air temperature falls below 36°F, the following cold weather clothing requirements will be adhered to:

- If wind chill is a factor, the cooling effect of the wind shall be reduced by shielding the work area or providing employees an outer windbreak layer garment.
- Extremities, ears, toes, and nose shall be protected from extreme cold by protective clothing.
- Employees performing light work and whose clothing may become wet shall wear an outer layer of clothing, which is impermeable to water.
- Employees performing moderate to heavy work and whose clothing may become wet shall wear an outer layer of clothing, which is water repellent.

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- Outer garments must provide for ventilation to prevent wetting of inner clothing by sweat.
- If clothing is wet, the employee shall change into dry clothes before entering a cold environment.
- Workers shall change socks at regular daily intervals or use vapor barrier boots.
- Workers who become immersed in water or whose clothing becomes wet shall immediately change their clothing and be treated for hypothermia if necessary. If the clothing becomes wet from sweating, the employee may finish the activity, which caused the sweating before changing into dry clothes.

Metal handles of tools and control bars will be covered by thermal insulating materials when temperatures fall below 30°F. Whenever the site becomes covered with snow or ice, eyewear providing protection against ultraviolet light, glare, and blowing ice crystals will be worn by employees.

7.3.2 Wind Speed

Wind speed monitoring will be conducted by RMRS (Procedure No. FO.1) during construction of the ETPTS to protect personnel from physical injury due to windblown debris, falls from elevated work surfaces, increased cold stress, and suspended dust particulates. In addition, controls will be established to minimize suspension of particulates such as water spray.

Portable wind anemometers or verification of wind speed from the shift supervisor will be used to determine wind speed. Table 7.6 lists the hazards and controls associated with working in windy conditions.

Table 7-6. Hazards and Controls Associated with Wind Speed.

Hazard	Action Level	Action(s)	Monitoring
Contamination dispersion	>15 mph average for two consecutive 15 minute periods	At discretion of Superintendent or HSO dust suppression	Continuous during field activities
Contamination dispersion	>30 mph average for two consecutive 15 minute periods	Terminate particulate generating activities	Continuous during field activities
Personnel injury	>45 mph average for two consecutive 15 minute periods	Secure area and terminate field operations	Continuous during field activities
Load hazard	>30 mph average for two consecutive 15 minute periods	Terminate lifting activities	Continuous or as determined by HSO

7.3.3 Noise

Personnel working at the task site may be exposed to noise levels in excess of 85 decibels (dB)(A) during construction activities. Noise monitoring will be performed and hearing protection worn if personnel are exposed to noise above a sustained level of 85 dB (A). Persons whose exposure exceeds the allowable level need to be enrolled in a Hearing Conservation Program that will meet the OSHA 1926.65 Hearing Protection requirements. Personnel will be required to wear hearing protection until the noise levels have been evaluated and will continue to wear the protection until directed otherwise by the HSO. Although not always required, wearing hearing protection when using heavy equipment is a good practice.

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If the time-weighted average of 85 dB(A) is exceeded, a personal monitoring program will begin for construction personnel. Noise dosimeters will be used to monitor individual exposure to noise and recorded according to DOE 5480.10, *Contractor Industrial Hygiene Program.* RFETS Hearing Conservation Program requires that high noise areas [sound levels greater than 85 dB(A)]) be posted as such.

7.3.4 Fire and Explosion Hazards

Fire hazards during this project are associated with the use of fuels for the general construction equipment. Fuel for the construction equipment will be stored in approved and labeled containers. Fuel tanks used for construction equipment will be placed out of traffic patterns and at least 50 feet from buildings and equipment. The tanks will be bermed and placed within spill containment. The storage area will be posted as a "NO SMOKING" area. No other flammable materials will be present, and no other fire hazards are anticipated other than those associated with welding operations. Such operations will be controlled by a Hot Work Permit.

7.3.5 Biological Hazards

Biological hazards such as plants, insects, and snakes may be present. The potential for contact with snakes or insects that may cause injury or disease exists when performing field activities at ETP. The ETP does not host any plants that are poisonous to humans, other than poison ivy. There are some plants that may be mechanically injurious (e.g., thorns, yucca). Field personnel will wear sturdy work clothes and steel-toe boots to help prevent injuries.

One type of venomous snake may be present in the ETP area, the prairie rattlesnake. Personnel should be aware that snakes may be present in the area and exercise caution, especially when working in previously undisturbed areas and locations with animal dens. If a snake is seen or if field personnel are bitten, the HSO should be notified immediately to receive further instruction.

Black widow spiders may be present at ETP sites. They are usually found in shady places or under rocks or wood. The black widow spider has a shiny black body about the size of a pea, with a red or yellow hourglass-shaped mark on its abdomen. It weaves shapeless webs in undisturbed areas. A bite may result in severe pain, illness, and possibly death from complications, but usually not from the bite itself.

In addition to spiders, ticks, chiggers, bees, and wasps may be nuisances to field personnel. Bites from wood ticks may result in the transmission of Rocky Mountain Spotted Fever , a serious and possibly fatal viral disease. The Rickettsia virus infects wood ticks, mostly in the late spring and early summer, and is characterized by chills, fever, severe pain in leg muscles and joints, and a body rash. Lyme Disease is not prevalent in Colorado. Some protection will be offered by PPE, but the use of insect repellent (containing at least 30 percent DEET) on outside clothing and exposed skin may also be warranted. Personnel should perform self-searches after each day to check for ticks and chiggers. Bees or wasps can be considerable hazards for those people with allergic reactions to venom. The HSO should be notified if any worker is sensitive to these insects. Sensitive personnel will report to medical department if bee sting occurs.

Based on the available information characterizing the ETP, hanta virus may be associated with the mice in the area. The virus is spread by contact with mice droppings and urine or through inhalation of airborne particles (distributed by wind or machines such as vacuums). Therefore any area suspected of containing nests should not be disturbed without taking proper precautions. These precautions include donning appropriate PPE, including gloves (double gloving preferred) and wearing of a HEPA filter. No vacuuming should be done causing the virus to become airborne and inhaled. The suspected area should be disinfected with a bleach solution and mice trapped

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for removal from the area. All traps should also be disinfected with bleach solution before and after use.

7.3.6 Confined Spaces

Excavations may be determined to be confined spaces as many large tanks or other enclosed areas yet to be defined. A confined space entry permit will be required for any entry into such a space. The HSO will issue confined space permits and control the safety briefings to personnel entering the confined space. An instrument (LEL O_2 meter) used to determine atmospheric concentrations of oxygen and lower explosive limits must be used before personnel can enter the confined space. Additional monitoring for other hazardous constituents may be required as determined by the HSO. Confined space work will be performed in compliance with the requirements of 29CFR 1910.146.

7.3.7 Construction Health and Safety Hazards

Various construction health and safety hazards, which may be encountered, are discussed below.

7.3.7.1 Personal Protective Equipment

Wearing PPE may reduce a worker's ability to move freely, see clearly, and hear directions and sounds that might indicate a hazard. Work activities at the task site will be modified as necessary to ensure personnel are able to work safely in the PPE required. PPE upgrades will be identified in the work authorization permits. At a minimum, steel toe/shank boots, hard hats and safety glasses will be required to be worn in the ETPTS construction area.

7.3.7.2 Handling Heavy Objects

Site personnel may risk injury by lifting heavy objects. Therefore, all personnel are cautioned against lifting heavy objects without adequate assistance. Mechanical and hydraulic assists will be used whenever possible to minimize lifting dangers.

Lifting and hoisting using a crane are controlled through guidance in the *HSP 12.02 DOE Hoisting and Rigging Manual.*

7.3.7.3 Moving Machinery and Falling Objects

Task site personnel may be subject to cuts and bruises or get caught in moving machinery during certain task site activities. Injuries will be avoided or minimized by following safe practices for operation of machinery; ensuring guards are maintained in place; wearing gloves, eye protection, hard hats, and steel-toed boots; and using mechanical assists whenever possible. Loose clothing or neck chains for security badges shall not be worn, and long hair must be pulled back and secured when working around equipment with moving parts.

7.3.7.4 Electrical Hazards

The power supply and electrical systems are not located in areas where intrusive soil activities are being performed. An outage permit and excavation permit will have to be issued before construction work begins. Clearance for underground and above ground utility hazards can be obtained from Kaiser-Hill Construction Management.

7.3.7.5 Elevated Work Areas

Although no elevated work areas are anticipated, personnel who work in these must be protected by safety harnesses, railings, or other approved devices to ensure personal safety. Elevated work area safety and required fall protection requirements will be identified during the hazard analysis and required work authorization permits. If fall protection situation exists, fall protection training will be provided. An outline of this training will be provided to RMRS Health and Safety for review.

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7.3.7.6 Trench Excavation Area

During installation of the ETPTS, a trench will be excavated for placement of the HDPE liner with a track-hoe. This trench will be approximately fifteen feet deep. Anyone approaching within six feet of an excavation, which is more than six feet deep, must be protected with a fall arrest device. Work in association with the trench excavation will be performed following the requirements of 29 CFR 1926, Subpart P.

7.3.7.7 Inclement Weather

If adverse weather conditions, such as sustained strong winds (25 mph or greater), electrical storms, heavy precipitation, or extreme cold, develop that pose a threat to persons or property on the task site, the situation will be evaluated by the HSO with input from the IHT and RCT and other personnel, as appropriate. A decision to stop all work at the task site will be made by the HSO with input from the IHT and RCT based on the hazards involved and the situation. In some cases, work at the site may proceed provided workers are afforded adequate, appropriate protection. At no time will individual health and safety be jeopardized to continue work.

7.4 Other Hazards

Personnel should look for potential hazards and immediately inform the line management or HSO of the hazards so action can be taken to correct the condition.

The HSO will conduct daily inspections of the task site to ensure barriers and signs are being maintained, unsafe conditions are corrected, and debris is not accumulating onsite. These inspections will be noted in the logbook. Health and safety professionals present at the task site may, at any time, recommend changes in work habits to the HSO.

Individuals working on the ETPTS are responsible for using safe work techniques, reporting unsafe working conditions, and exercising good personal hygiene and housekeeping habits throughout the course of their job.

RMRS and their sub-contractors have adopted the NFPA diamond marking system for all containerized hazardous substances. This system will be used for container identification. NFPA labels identify the fire, health, reactivity, and specific hazard of the material. Any chemicals that the construction management brings on to the site are required to have MSDSs. All such materials will be inventoried and MSDSs filed by the Superintendent for audit and hazard communication purposes.

7.5 Response to Unknown Hazards

In the event that unexpected hazards or conditions are encountered during investigation activities, project activities will pause to allow assessment of the potential hazard or condition. The Superintendent and HSO will be notified immediately, as well as the Project Manager. The potential hazard or condition will be evaluated to determine the severity or significance of the hazard or condition, and whether the controls on the project are sufficient to address the hazard or condition. Based on this initial evaluation, a determination will be made whether to proceed with controls currently in place; segregate the condition or hazard from the project activity, if it can be done safely, or curtail operations to address the unexpected hazard or condition. Concurrence down the selected path must be obtained from the RMRS ER Director, John Law, or his designee.

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8.0 HAZARD COMMUNICATIONS

All project personnel, including subcontractors, must follow established work practices to safely handle hazardous chemicals. The implementation of a hazard communication program is also required by 29 CFR 1926.65 for RCRA treatment, storage, and disposal facilities. The HSO will maintain an inventory of hazardous chemicals stored at the project trailer and MSDSs for those chemicals that will be available to employees at the site.

8.1 Hazardous Materials Inventory

The HSO will compile an inventory of hazardous chemicals present at the work sites and provide this information to the RMRS Industrial Hygiene Department. The inventory may be requested by emergency response personnel to aid in identifying hazards associated with a spill or accident at the site.

8.2 Material Safety Data Sheets

The MSDS must be readily available to employees for hazardous chemicals used or stored at the site. Information found on an MSDS includes identification of the product's hazardous chemical constituents, its physical characteristics, applicable exposure limits, symptoms of overexposure, recommended PPE, fire and explosion hazards, and spill response actions. This information is provided by the manufacturer and is typically included with the shipment of the chemical. The Kaiser-Hill Chemical Inventory maintains a master file of MSDS for materials stored or used at the plant in building T130-C. A complete file of MSDSs for hazardous chemicals used at the ETP will be kept at the project trailer and be readily available to site personnel.

8.3 Training

All project personnel are required to complete Hazard Communication training as part of their 40-hour OSHA training. Specific training on the information provided in the project MSDSs will be conducted by the HSO, or, if necessary, by a representative of the RMRS Industrial Hazards Department. Specific hazards associated with the project will be communicated to workers at the site-specific briefing and then at the weekly safety meetings. Job specific Hazard Communication training will be document for each employee.

9.0 SAFE WORK PRACTICES

Providing for safe working conditions is a primary objective of this HASP. In addition to the specific requirements for working in the East Trench Plume Site, the following section describes those work practices that apply to any construction activities.

9.1 General Safe Work Practices

The following are general safe work practices that will be followed at the task site:

- Absolutely do not eat, drink, chew gum or tobacco, smoke, apply cosmetics, or do anything else that increases the probability of hand-to-mouth transfer and ingestion of materials except in designated areas.
- Report all broken skin or open wounds to the HSO. The OMP evaluation will consider how the wound is bandaged and will recommend any PPE to be worn by the injured employee.
- Avoid direct contact with potentially contaminated substances. Do not walk through spills or other areas of contamination. Avoid kneeling, leaning, or sitting on equipment or ground that may be contaminated.
- If suspect materials, such as yellow material, metal drums, etc., are unearthed, top work, move away from the area, and notify the Superintendent or HSO.
- Be alert for dangerous situations, strong or irritating odors, airborne dusts or vapors, and broken containers. Report all potentially dangerous situations to the Superintendent or HSO.
- If contamination is detected, stop work and leave the area as directed by the Superintendent or HSO. Wait for instructions from the Superintendent or HSO in the gathering area.
- Prevent releases of hazardous materials, including those used at the task site. If a spill occurs, contain it (if possible) and report it to the Superintendent or HSO (and facility representative, where applicable). Steps must then be taken to clean up the spill in accordance with the appropriate procedure, which may mean activating the emergency preparedness procedures for the area. Appropriate spill kits or other containment and absorbent materials will be maintained at the work site.
- Keep all ignition sources at least 50 feet from explosive or flammable environments.
- All drilling or overhead crane operations will stop and be evaluated when wind speed exceeds 25 miles per hour (mph) sustained.
- Be familiar with the physical characteristics of the task site. Many of the items listed below are specifically described in other sections of the HASP. The physical characteristics include but are not limited to:
  - Wind direction
  - Accessibility of fellow workers, equipment, and vehicles
  - Communications at the task site and with other nearby facilities
  - Areas of known or suspected contamination which include locations of pits
  - Subsidence in the Mound Site Area resulting in uneven surfaces and holes from spring water infiltration
  - Major roads and means of access to and from the task site
  - Nearest water sources and fire fighting equipment
  - Warning devices and alarms
  - Capabilities and location of the nearest emergency assistance
- If you are working in the EZ (see Section 9.3 of this HASP), then work in teams according to the "buddy system."
- All barriers erected for control of construction hazards will be labeled to reflect the nature of the hazard. Signs and barriers shall not conflict with radiological signs and postings.

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9.2 ALARA Principles

Personnel working at the task site must keep radiation and chemical exposure As Low As Reasonably Achievable (ALARA) through the following practices:

- Adhere to all written requirements as described in Section 8.0 of this HASP and verbal guidance.
- Be aware of personal radiation exposure history (all radiation workers will maintain daily dose records). All subcontractor personnel will provide the radiological engineer with work records including radiation dose history.
- Work within ALARA guidelines and make suggestions as needed.
- Minimize the production of all radiological and chemical waste.
- Minimize personal radiation exposure by adhering to these basic protection techniques:
  - Time—Exposure is minimized as time is minimized
  - Distance—Maintain a maximum distance from the radiation source
  - Shielding—Use any solid material (such as lead, steel, or concrete) as a shield
  - Limits—Radiation exposure limits are contained in the (ROI).

9.3 The Buddy System

The buddy system will be used at the ETP to ensure each worker's mental and physical well-being is monitored during the course of the day. Individual buddies will not be assigned, but the system will be informally incorporated to ensure construction personnel are aware of fellow construction personnel. Everyone should watch for signs and symptoms of illness or injury in their "buddy." A formalized buddy system, the assigning of buddies, will be performed for all emergency response conditions.

9.4 Construction Health and Safety

General construction safety will be the responsibility of all personnel involved in the construction phase. The Superintendent will have the identified task to ensure safety equipment inspections are being performed and equipment is safe to operate. Personnel are required to perform a daily check of equipment to ensure it is safe to operate.

The following are General Safe Work practices when working around heavy earthmoving equipment that is typically used in this type of activity:

- Heavy Equipment Operators will be adequately trained in the limitations of their equipment.
- All heavy equipment will have an operable back up alarm able to be distinguished above the ambient noise levels
- Heavy equipment will receive a documented pre-operational check at the start of each shift to determine if all required safety systems and equipment are present and operable
- Heavy earthmoving equipment will have certified Roll Over Protective Structures
- Seat safety belts will be available for all operators and passengers and will be used when the vehicle is in operation
- Personnel will only operate or ride in locations provided by the manufacturer for that purpose
- Construction equipment will not be left unattended unless shut down and secured against movement
- All equipment leaving the work site will be surveyed and must be determined free of radioactive contamination.

9.5 Sanitation

Provisions regarding sanitary waste and drinking water are described below. Hand washing facilities will be provided at both the break trailer and the site support zone.

9.5.1 Sanitary Waste

Portable restroom facilities will be provided. The construction phase will not utilize a central sanitary waste system. Restroom facilities have been located in the Support Zone away from potential hazardous wastes. The facilities will be located and controlled to ensure no hazardous wastes are introduced into the sanitary waste holding tanks. In addition hand washing facilities including soap and rinse water will be provided in a designated area near the portable restrooms.

9.5.2 Drinking Water

Drinking water is provided through RMRS sub-contracted bottled water suppliers or supplied by OHM. There will be no other source of drinking water in the immediate area.

10.0 CONSTRUCTION BULLETIN BOARD

To promote and maintain a highly visible safety profile on the work-site, each construction project shall establish a Safety Bulletin Board. Bulletin boards will be at the break trailer where they are readily accessible and may be easily read by employees and visitors to the work-site. Bulletin boards will be of sufficient size to accommodate the following postings.

- Project Information Card
- Appropriate required OSHA, Colorado Worker's Compensation Posters
- Appropriate safety posters and safety information signs (e.g., PPE requirements for the work area).

11.0 DECONTAMINATION PROCEDURES

The objectives of decontamination are to remove hazardous substances from workers and equipment, to ensure compliance with DOE Order 5480.11 and OSHA Standard 29 CFR 1926.65, to prevent the spread of contamination from the site, and to prevent potential adverse health effects that could be caused by contact with hazardous materials by unprotected workers.

Safe work practices and engineering controls should be undertaken to prevent equipment and personnel from becoming contaminated during the work on this site. All equipment, samples, personnel, and vehicles leaving the EZ will be checked for radiological contamination, and effective appropriate decontamination procedures will be undertaken to remove any contamination prior to release of the equipment from the site.

Protective equipment and respirators will be removed in this area. Containers will be provided for collection of disposable protective clothing.

All disposable equipment and supplies and PPE (except respirators) potentially contaminated with hazardous or radioactive material will be placed in a labeled bag or other container and left onsite pending sample analysis results, which will determine disposal options.

11.1 Personnel and Small Equipment Decontamination

Based on process knowledge and expected concentrations of contaminants, chemical contamination is not anticipated and Level D PPE will be used. For Level D PPE, decontamination of personnel will require only a soap and water wash immediately after exiting the exclusion zone and before eating, drinking, smoking, etc. A wash station consisting of a soap and tap water wash basin and a tap water rinse basin will be set up at the central decontamination area. A separate set of wash basins will be set up for sample small equipment decontamination.

If the skin does come into contact with any residual material, the affected areas will be washed with soap and large amounts of water until no evidence of solid chemical remains (approximately 15 to 20 minutes). In case of eye contact, the eyes will be rinsed immediately with large amounts of water or normal saline solution, occasionally lifting both upper and lower lids, until no evidence of chemical remains (approximately 15 to 20 minutes).

The HSO is responsible for determining whether radiological contamination of personnel or equipment exists and for prescribing the decontamination procedures that will be required. Appropriate PPE will be used during decontamination operations as an additional measure to prevent direct employee exposure to hazardous substances.

Current RMRS SOPs should be consulted for specific decontamination requirements. These procedures include SOP F0.03. - General Equipment Decontamination and SOP FO.06 Handling of PPE.

Respirators should be wiped clean by site personnel as they are removed. They must be stored in a plastic bag, with the cartridge side down, so that distortion of the face piece does not occur.

11.2 Surface Contamination Surveys

The purpose of the surface contamination surveys will be to control and document all property and material to be released from the RCA. All equipment which leaves the RFETS must be surveyed and comply with all requirements of EMRG 3.2 - Survey Requirements for Conditional and Unrestricted Use. Radiological screening will be performed by the project RCT or by project personnel trained and approved by EMRE in performing this function.

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12.0 EMERGENCY RESPONSE PLAN FOR TASK SITE

This HASP has been developed to allow site activities to be conducted without adverse impact on the safety of the worker, the community, and the environment. Procedures included in this section address the action required in the event of extraordinary conditions that might occur at the site. In addition, a stand-alone Emergency Plan has been developed and will be maintained on the project site.

12.1 Pre-Emergency Planning

During site-specific orientation and at daily safety meetings, all employees will be trained in and reminded of the provisions of this emergency response plan, the communication systems, and evacuation routes. This plan will be reviewed and revised, if necessary, on a regular basis. This will ensure that the plan is adequate and consistent with prevailing site conditions.

12.2 Notification

LIFE-THREATENING EMERGENCIES
CALL EXTENSION 2911

NON LIFE-THREATENING EMERGENCIES
CALL EXTENSION 2914

Notification requirements for emergency situations at ETP depend on the nature of the perceived emergency (e.g., spill injury, fire) and the extent to which the damage and/or injuries have progressed. Upon discovery of a release of materials or other non life-threatening emergency situation, the Shift Superintendent will be notified at extension 2914. If there is no answer at 2914, refer to 2911. If the situation is life-threatening, Rocky Flats Plant (RFP) emergency response personnel will be notified as detailed below.

Call Extension 2911 to obtain emergency assistance for life-threatening emergencies and to simultaneously access the following:

- Emergency Coordinator (EC), Shift Superintendent
- Plant Protection Central Alarm Station
- Fire Department Dispatch Center
- Medical Department

As much detail about the emergency as possible shall be provided. A decision to dispatch any or all of the following equipment will be based on the provided information:

- Fire Engine
- Ambulance
- Hazardous Material (HAZMAT) Response Vehicle

Provide the following information, upon request, to the Emergency Dispatcher:

- Informant's name
- Exact location of the emergency
- Nature of the emergency
- Condition of the patient if applicable (breathing, consciousness, bleeding, etc.)
- Special hazards in the area
- Any other information requested

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If no details are given, emergency response personnel will respond automatically. The EC will respond immediately to emergencies. The RFP Protection Central Alarm Station will activate the Building Emergency Support Team by the Life Support/Plant Warning Public Address System. The EC will activate the Emergency Operation Center and notify departments that have an advisory role in the situation, if applicable. The EC will determine whether additional help from off-site agencies (e.g., police, hospitals) is required.

The EC will also notify the following groups when appropriate:

- Radiological Engineering
- Industrial Hygiene
- Occupational Safety
- Waste Operations
- Waste Programs
- Traffic
- Occurrence Notification Officer
- Health and Safety Administrator

12.2.1 Emergency Contact/Notification Listing

Emergency Contact Telephone and Pager Numbers

Fire 2911
Ambulance.....2911
Poison Center.....629-1123
Security.....2911

12.2.2 Key Project Personnel

Additional Project Telephone Numbers

Director - ER - John Law.....4842/4504
Safety Team Lead - Ken Jenkins 5374/212-5693
Project Manager - Annette Primrose 4385/212-6338
H&S Supervisor – Skip Chandler 6673/1659
QA/QC -TBD
HAZMAT Emergency Response 2911
Occupational Health General Information 2594
OHM Project Manager - Dan Gravelding.....303-793-5278/888-490-4361
OHM Health and Safety Officer - TBD
OHM Program Manager – Jay Green 303-793-5211

12.3 Specific Site Hazards

The response to and abatement of most emergency situations from the ETP will require the expertise of RFP emergency response personnel. Situations that will require the assistance of RFP emergency responders include, but are not limited to the following:

- Accidents resulting in physical injury
- Accidents resulting in radiological exposure
- Incidents where the substance cannot be absorbed, neutralized or otherwise controlled at the time of release
- Situations where there is a potential for safety or health hazards

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12.4 Spills of Hazardous and Radioactive Mixed Waste and Hazardous Material

REPORT TO THE EC AT EXTENSION 2911 all spills where the substance cannot be absorbed, neutralized, or otherwise controlled at the time of release, or where there is a potential for safety or health hazards (fire, explosion, chemical, or radiological exposure). The EC will dispatch the HAZMAT Response Vehicle and any other necessary support personnel.

Spills that do not require a HAZMAT response shall be cleaned up by site personnel according to an approved RMRS SOP. Spills onto porous ground will require removal of contaminated dirt as well as the spilled material and are expected to be classified as hazardous and radioactive mixed waste and are reportable.

12.5 Post-Emergency Response Equipment Maintenance

Equipment used in emergency situations will be decontaminated by wiping with a soap solution. Rags used for decontamination will be disposed as low-level radioactive waste, if necessary. Contaminated heavy equipment used in emergencies will be thoroughly decontaminated prior to being released from the site. The decontamination protocols described in SOPs FO. 10 - Heavy Equipment Decontamination, FO. 1.1 - Handling of Decontamination Water and Wash Water, and FO. 18 - Decontamination Facility Operations will be followed. Equipment will not be released until monitoring indicates that contaminant levels are less than 20 disintegrations per minute/100 square centimeters (above background) and that chemical contamination is not present.

12.6 Emergency Equipment Location

Fire extinguishers will be located in all field vehicles and will be temporarily located at sites where there is a potential for fires (e.g., during welding operations).

12.7 Evacuation Plan

Personnel and visitors to ETP will evacuate the area if any of the following occur:

- If an emergency (such as a fire or chemical spill) develops
- If instructed by site supervision
- If instructed by the Shift Superintendent over the site radio or telephone system.

After an evacuation, each Supervisor will verify that the employees that he/she supervises are accounted for. The evacuation routes will be posted at the site and procedures will be reviewed with the field personnel by the HSO prior to the start of work. The wastewater treatment plant located to the north of the ETP will be used as an assembly area.

12.8 Communication

Radios will be used by field personnel to maintain contact with the Superintendent or other designated persons in the trailers who have access to telephones. The HSO or Superintendent will monitor the radio frequency in use by field personnel at all times during field operations. At least one radio will be onsite during construction hours. More radios may be issued to other personnel as needed.

13.0 REFERENCES

DOE 1992, *Historical Release Report for the Rocky Flats Plant*, Rocky Flats Plant, Golden CO.

DOE 1995, *Final Phase II RFI/RI Report, 903 Pad, Mound, East Trenches Area. Operable Unit No. 2*, RF/ER-95-0079.U.N.

DOE 1996, *Final Rocky Flats Cleanup Agreement*, Rocky Flats Environmental Technology Site, Golden CO.

EPA 1996, *Draft Rocky Flats Geoprobe Investigations I "Mound" and Seep 59 Areas*, October.

EG&G 1994, *Soil Vapor Survey Report for the Operable Unit No. 2 Subsurface Soil Interim Remedial Action*, January.

RMRS 1997, *Final Sampling and Analysis Plan for the Pre-Remedial Investigation of the Mound Site Plume*, RF/RM RS-97-002, February.

RMRS 1996a, *Results of the 1996 Pre-Remedial Investigation of the Mound Site*, RF/RMRS-96-0055.UN.

RMRS 1996b, *Draft Trenches and Mound Site Characterization Report*, RF/ER-96-0044.UN.